NOTICE

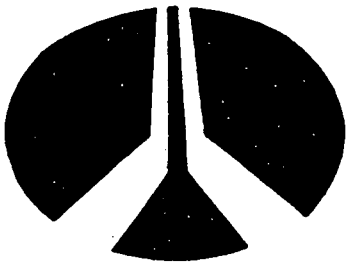
All drawings located at the end of the document.

Resource Conservation and Recovery Act Closure Plan Tanks T-40, T-66, T-67, T-68 Hazardous Waste Management Unit 55

For U.S. D.O.E.-Rocky Flats Plant
Transuranic Mixed Wastes

CO7890010526

29 SEPTEMBER 1989



Rockwell International

RCRA CLOSURE PLAN FOR
T-40, T-66, T-67 AND T-68 OF SOLID WASTE MANAGEMENT UNIT 55

LIST OF TABLES

LIST OF FIGURES

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
SUBPART G-CLOSURE AND POST CLOSURE 265.110 through 265.120		
Applicability: 265.110	*265.110(b)3*	
(b) Sections 265.117-265.120 (which concern post-closure care) apply to the owners and operators of (3) tank systems that are required under 265.197 to meet requirements for landfills.		4.1
Closure Performance Standard 265.111	*265.111*	4.0

RC-1

The owner or operator must close his facility in a manner that:

a. Minimizes the need for further maintenance; and

b. Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring.

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION

c. Complies with the closure requirements of this Subpart including, but not limited to the requirements of Sections 265.197, 265.228, 265.258, 265.280, 265.310, 165.351, 265.381, and 265.404.

Detailed Description of Steps Necessary to Close the Treatment/Storage Facility:
265.112(b)1 *265.112(b)1* 4.2-4.4

Content of Plan. The plan must identify the steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:

1. A description of how each hazardous waste management unit at the facility will be closed in accordance with Section 165.111; and

RC-2

Identification of Maximum Extent of Operation of the Treatment/Storage Facility:
265.112(b)2 *265.112(b)2* 2.0

2. A description of how final closure of the facility will be conducted in accordance with Section 265.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..
2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Removal and Management of Hazardous Wastes:		
Estimate of Maximum Inventory of Hazardous Waste in the Treatment/Storage Facility: 265.112(b)3	*265.112(b)3*	2.4
3. An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the types(s) of the off-site hazardous waste management units to be used, if applicable; and		
Detailed Description of Removal or Decontamination of Hazardous Waste Inventory and Systems: 265.112(b)4	*265.112(b)4*	5.0, Appendix A
4. A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination necessary to satisfy the closure performance standard; and		

RC-3

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Detailed Description of Other Necessary Activities: 265.112(b)5	*265.112(b)5*	5.0, Appendix A
5. A detailed description of other activities necessary during the partial and final closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and		
Closure Schedule for The Hazardous Waste Management Unit: 265.112(b)6	*265.112(b)6*	6.0
A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included); and		
Estimate of the Expected Year of Closure: 265.112(b)7	*265.112(b)7*	6.0
7. An estimate of the expected year of final closure ... for facilities without approved closure plans.		

RC-4

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Notification of Partial Closure and Final Closure; Submittal of Closure Plan: 265.112(d)1	*265.112(d)1*	1.1 Note: Compliance Agreement has modified submittal date requirement.

1. The owner or operator must submit the closure plan to the Department at least 45 days prior to the date on which he expects to begin final closure of a facility with only tanks.

Initiation of Closure Activities:
265.112(d)2 — 6.0

2. The date when he "expects to begin closure" must be either within 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes or, if there is a reasonable possibility that the hazardous waste management until will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous waste.

RC-5

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Time Allowed for Closure: Removal of Hazardous Wastes from the Units: 265.113(a)	265.113(a)	6.0

Within 90 days after receiving the final volume of hazardous wastes at a hazardous waste management unit or facility, or within 90 days after approval of the closure plan, whichever is later, the owner or operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Department may approve a longer period if the owner or operator demonstrates that:

(1)(i) The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; and

(2) He has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable interim status requirements.

RC-6

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Completion of Partial and Final Closure Activities: 265.113(b)	*265.113(b)*	6.0

The owner or operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes at the hazardous waste management unit or facility or 180 days after approval of the closure plan, if that is later. The Department may approve an extension to the closure period if the owner or operator demonstrates that;

(1)(i) The partial or final closure activities will, of necessity, take him longer than 180 days to complete; and

(2)He has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable interim status requirements.

Time Limitations for Extending Closure Activities 265.113(c)	*265.113(c)*	6.0

(c)The demonstrations referred to in Section 265.113(a) and (b) must be made as follows: (1) The demonstrations in paragraph (a) must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a); and (2) The demonstrations in paragraph (b) must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b).

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Disposal or Decontamination of Equipment, Structures and Soils: 265.114	*265.114*	5.9
During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in Sections 265.228, 265.258, 265.280 or 265.310. By removing all hazardous wastes or hazardous constituents during partial and final closure, the owner or operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of Part 262 of these regulations.		
Certification of Closure: 265.115	*265.115*	10.0
Within 60 days of completion of closure of each landfill unit, and within 60 days of the completion of final closure, the owner or operator must submit to the Department by registered mail, a certification that the hazardous waste management unit has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Department upon request until he releases the owner or operator from the financial assurance requirements for closure under 266.14.		

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Survey Plat: 265.116	*265.116*	10.0

No later than the submission of the certification of closure of each hazardous waste disposal unit, an owner or operator must submit to the authority with jurisdiction over local land use, and to the Department, a survey plat indicating the location and dimensions of hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.

RC-9

Post-Closure Care and Use of Property; Initiation, Monitoring and Maintenance of Systems; 265.117(a)1	*265.117(a)1*	*9.0*

Post-closure care for each hazardous waste management unit subject to the requirements of Sections 264.117-264.120 must begin after completion of closure of the unit and continue for 30 years after that date. It must consist of at least the following:

(i) Monitoring and reporting in accordance with the requirements of Subpart F, and N of this Part; and

(ii) Maintenance of monitoring and waste containment systems in accordance with the requirements with Subparts F, and N of this Part.

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1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Performance of Post-Closure Activities: 265.117(d)	*265.117(d)*	9.0

All post-closure care activities must be performed in accordance with the provisions of the approved post-closure plan as specified in 265.118.

Post-Closure Plan; Identification of Post-Closure Activities: 265.118(c)	*265.118(c)*	9.0

For each hazardous waste management unit subject to the requirements of this Section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:

(1) A description of the planned monitoring activities and frequencies at which they will be performed to comply with Subparts F, and N of this Part during the post-closure period; and

(2) A description of the planned maintenance activities and frequencies at which they will be performed,to ensure:

(i) The integrity of the cap and final cover or other containment systems in accordance with the requirements of Subpart N of this Part; and

(ii) The function of the monitoring equipment in accordance with the requirements of Subpart N of this Part; and

(3) The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit during the post-closure care period.

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Post-Closure Plan Submittal: 265.118(e)	*265.118(e)*	1.1 Note: Compliance Agreement has modified submittal date
The owner or operator of a facility with hazardous waste management units requirement subject to these requirements must submit his post-closure plan to the Department at least 180 days before the date he expects to begin partial or final closure of the first hazardous waste disposal unit. The date when he "expects to begin closure" of the first hazardous waste disposal unit must be within 30 days after the date on which the hazardous waste management unit receives the known final volume of hazardous waste.		
Post-Closure Notices: Record of Wastes Disposed: 265.119(a)	*265.119(a)*	9.0
No later than 60 days after certification of closure of the hazardous waste disposal unit, the owner or operator must submit to the authority with jurisdiction over local land use, and to the Department a record of the type, location, and quantity of hazardous wastes disposed of within the disposal unit.		

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1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Record of Land Use: 265.119(b)	*265.119(b)*	9.0

Within 60 days of certification of closure of the hazardous waste disposal unit the owner or operator must:

(1) Record, in accordance with State law, a notation to the deed to the facility property - or on some other instrument which is normally examined during title search - that will in perpetuity notify any potential purchaser of the property that:

(i) The land has been used to manage hazardous wastes;
(ii) Its use is restricted under this Subpart; and
(iii) The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within the hazardous waste disposal unit of the facility required by Section 265.116 and 265.119(a) have been filed with the authority with jurisdiction over local land use and with the Director of the Colorado Department of Health; and

(2) Submit a certification, signed by the owner or operator, that he has recorded the notation specified in paragraph (b)(1) of this Section, including a copy of this document in which the notation has been placed, to the Department.

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Certification of Completion of Post-Closure Care: 265.120	*265.120*	9.0

No later than 60 days after completion of the established post-closure care period for the hazardous waste disposal unit, the owner or operator must submit to the Department, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner or operator and an independent registered professional engineer.

SUBPART J - CLOSURE AND POST-CLOSURE CARE
265.190 through 265.201

RC-13

Applicability:
265.190 *265.190*

The requirements of this Subpart apply to owners and operators of facilities that use tank systems for storing or treating hazardous waste.

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Closure and Post-Closure Care; Removal or Decontamination of Wastes and Tanks; 265.197(a)	*265.197(a)*	5.0, 7.0
At closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste, unless Section 261.3(d) of these regulations applies. The closure plan, closure activities, cost estimates for closure, and financial responsibility for tank systems must meet all of the requirements specified in Subpart G of this part and Part 266 of these regulations.		
Partial Closure and Post-Closure Care; 265.197(b)	*265.197(b)*	9.0
If the owner or operator demonstrates that not all contaminated soils can be practicably removed or decontaminated as required in paragraph (a) of this section, then the owner or operator must close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (Section 265.310). In addition, the purposes of closure, post-closure, and financial responsibility, such a tank system is then considered to be a landfill, and the owner or operator must meet all the requirements for landfills specified in Subpart G of this part and part 266 of these regulations.		

RC-14

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Landfills - Closure and Post-Closure Care:		
At Final Closure:		
265.310(a)	*265.310(a)*	9.0

At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:

(1) Provide long-term minimization of migration of liquids through the closed landfill;
(2) Function with minimum maintenance;
(3) Promote drainage and minimize erosion or abrasion of the cover;
(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and
(5) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

Post-Closure Care:		
265.310(b)	*265.310(b)*	9.0

After final closure, the owner or operator must comply with all post-closure requirements contained in Sections 265.117-265.120 including maintenance and monitoring throughout the post-closure care period. The owner or operator must:

(1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cover as necessary to correct the effects of settling, subsidence, erosion, or other events;
(2) Maintain and monitor the ground water monitoring system and comply with all other applicable requirements of Subpart F of this part;
(3) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and
(4) Protect and maintain surveyed benchmarks used in complying with Section 265.309.

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
SUBPART F - GROUNDWATER MONITORING 265.90 through 265.94		
Applicability: Implementation of Groundwater Monitoring: 265.90(a)	*265.90(a)*	5.0, Appendix A
The owner or operator of a landfill, which is used to manage hazardous waste must implement a ground-water monitoring program capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility, except as 265.1 provides otherwise.		
Installation of Groundwater Monitoring System: 265.90(b)	*265.90(b)*	5.0, Appendix A
Except as paragraph (d) of this section provides otherwise, the owner or operator must install, operate, and maintain a ground-water monitoring system which meets the requirements of 265.91, and must comply with 265.92-265.94. This ground-water monitoring program must be carried out during the active life of the facility, and for disposal facilities, during the post-closure care period as well.		

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Alternate Monitoring System: 265.90(d)	*265.90(d)*	5.0, Appendix A

If an owner or operator assumes that ground-water monitoring of indicator parameters in accordance with 265.91 and 265.92 would show statistically significant differences when evaluated under 265.93(b), he may, install, operate, and maintain an alternate ground-water monitoring system (other than the one described in 265.91 and 265.92). If the owner or operator decides to use an alternate ground-water monitoring system he must:

(1) Submit to the Department a specific plan, certified by a qualified geologist or geotechnical engineer, which satisfies the requirements of 265.93(d)(3), for an alternate groundwater monitoring system;

(2) Initiate the determinations specified in 265.93(d)(4);

(3) Prepare and submit a written report in accordance with 265.93(d)(5);

(4) Continue to make the determinations specified in 265.93(d)(4) on a quarterly basis until final closure of the facility; and

(5) Comply with the recordkeeping and reporting requirements in 265.94(b).

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

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COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Capability of Groundwater Monitoring System: 265.91(a)	*265.91(a)*	5.0, Appendix A

A groundwater monitoring system must be capable of yielding ground-water samples for analysis and must consist of:

(1) Monitoring wells (at least one) installed hydraulically upgradient from the limit of the waste management area.

(2) Monitoring wells (at least three) installed hydraulically downgradient at the limit of the waste management area. Their number, locations, and depths must ensure that they immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer.

RC-18

Monitoring System Requirements: 265.91(b)	*265.91(b)*	5.0, Appendix A

Separate monitoring systems for each waste management component of a facility are not required provided that provisions for sampling upgradient and downgradient water quality will detect any discharge from the waste management area. In the case of a facility consisting of more than landfill, the waste management area is described by an imaginary boundary line which circumscribes the several waste management components.

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Monitoring Well Requirements: 265.91(c)	*265.91(c)*	5.0, Appendix A
All monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole.		
Sampling and Analysis: Develop Groundwater Sampling and Analysis Plan: 265.92(a)	*265.92(a)*	Appendix A
The owner or operator must obtain and analyze samples from the installed ground-water monitoring system. The owner or operator must develop and follow a ground-water sampling and analysis plan. He must keep this plan at the facility. The plan must include procedures and techniques for: (1) Sample collection; (2) Sample preservation and shipment; (3) Analytical procedures; and (4) Chain of custody control		
Required Parameters: 265.92(b)	*265.92(b)*	Appendix A
The owner or operator must determine the concentration or value of the parameters listed in 265.92(b)1, 2 and 3 in ground-water samples in accordance with paragraphs (c) and (d) of this section.		

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
Establishment of Background Concentrations: 265.92(c)1	*265.92(c)1*	Appendix A
For all monitoring wells, the owner or operator must establish initial background concentrations or values of all parameters specified in paragraph (b) of this section. He must do this quarterly for one year.		
Replicate Measurements: 265.92(c)2	*265.92(c)2*	Appendix A
For each of the indicator parameters specified in paragraph (b)(3) of this section, at least four replicate measurements must be obtained for each sample and the initial background arithmetic mean and variance must be determined.		
Monitoring in Years Following First: 265.92(d)	*265.92(d)*	
After the first year, all monitoring wells must be sampled and the samples analyzed with the frequencies indicated in 265.92(d) 1 and 2, and (e).		
Preparation, Evaluation and Response: 265.93(a)	*265.93(a)*	
The owner or operator must prepare an outline of a ground-water quality assessment program. The outline must describe a more comprehensive ground-water monitoring program (than that described in 265.91 and 265.92) capable of determining:		

1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION

(1) Whether hazardous waste or hazardous waste constituents have entered the ground water;
(2) The rate and extent of migration of hazardous waste or hazardous waste constituents in the ground water; and
(3) The concentrations of hazardous waste or hazardous waste constituents in the ground water.

Recordkeeping and Reporting:

265.934(b) *265.94(b)*

If the ground water is monitored to satisfy the requirements of 265.93(d)(4), the owner or operator must:

(1) Keep records of the analyses and evaluations specified in the plan, which satisfies the requirements of 265.93(d)(3), throughout the post-closure care period; and
(2) Annually, until final closure of the facility, submit to the Department a report containing the results of ground-water quality assessment program which includes, but is not limited to, the calculated (or measured) rate of migration hazardous waste constituents in the ground water during the reporting period. This information must be submitted no later than March 1 following each calendar year.

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1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..
2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

REGULATORY CHECKLIST FOR T-40, T-66, T-67 AND T-68,
UNIT 55, BUILDING 774 TREATMENT AND STORAGE FACILITY

COLORADO REGULATIONS 6 CCR 1007-3[1] SECTION/REQUIREMENT	FEDERAL REGULATIONS 40 CFR[2] SECTION	CLOSURE PLAN SECTION
PART 266 COLORADO FINANCIAL REQUIREMENTS		
266.10 through 266.18		
Applicability to Hazardous Waste Facilities		
266.10(a)	*265.140(a)*	7.0
The requirements of Section 266.12, 266.14 and 266.16 through 266.17 apply to owners and operators of all hazardous waste facilities, except as provided otherwise in this section or in 264.1.		
Applicability to State and Federal Facilities:		
266.10(c)	*265.140(c)*	7.0
The State of Colorado and the Federal government are exempt from the requirements of Part 266 of these regulations.		

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1 Code of Colorado Regulations, Title 6, Chapter 1007, Article 3, Subpart G, Closure, and Post-Closure, Subpart J, Tanks and Subpart F, Groundwater Monitoring..

2 Code of Federal Regulations, Title 40, Part 265, Subpart G, Closure and Post-Closure, Subpart J, Tank Systems and Subpart F, Groundwater Monitoring.

SECTION 1.0
INTRODUCTION

1.1 PLAN PURPOSE

This closure plan provides for the interim status closure of four concrete tanks, known as T-40, T-66, T-67 and T-68, which are part of Hazardous Waste Management Unit 55 (Unit 55) in Building 774. The tanks will be closed in compliance with Title 40, Code of Federal Regulations (40 CFR), Part 265 closure regulations and in accordance with the Compliance Agreement entered into by the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and the Colorado Department of Health (CDH). This plan addresses hazardous waste regulations as detailed in the Code of Colorado Regulations (CCR), Title 6, Chapter 1007, Article 3, (6CCR 1007-3), Subpart G, Closure and Post-Closure and Subpart J, Tanks.

T-40, T-66, T-67 and T-68 are discussed in the Part B Permit Application, TRU Mixed Waste, dated July 1, 1988. However, these four tanks are being taken out of service on September 30, 1989 and will be closed under interim status regulations. This action is being taken because they cannot be certified and, therefore, do not meet the requirements for final permitting standards. Submittal of a closure plan is required for closure of hazardous waste management facilities under the Resource Conservation and Recovery Act (RCRA) Part B.

The primary objective of this closure plan is to assure that the facility is closed in a manner that minimizes the need for further maintenance and which controls, minimizes, or eliminates, to the extent necessary, threats to human health and the environment from hazardous constituents. Radionuclide contamination is a concern for personnel safety and material disposal; however, radionuclide decontamination is not addressed in this closure plan because it is not regulated by hazardous waste management rules. Radionuclide contamination will be addressed under the appropriate DOE regulations and policies.

1.2 PLAN ORGANIZATION

A description of the facility, its processes, and particular information regarding the tanks is provided in Section 2.0. Data in Section 2.0 includes waste generation activities in Building 771 which impact Building 774; where waste is accumulated prior to treatment; a summary of the treatment steps involved; and the waste volume and characteristics particular to T-40, T-66, T-67 and T-68.

Section 3.0 provides the background information on existing environmental conditions. This background information was generated to address a waste management unit, known as the Solar Evaporation Ponds, which is undergoing closure activities. The Solar Evaporation Ponds are located immediately southeast of Building 774. This current data evaluates ground water and soils near Building 774 and a nearby french drain system now in use to collect contaminated ground water from these ponds.

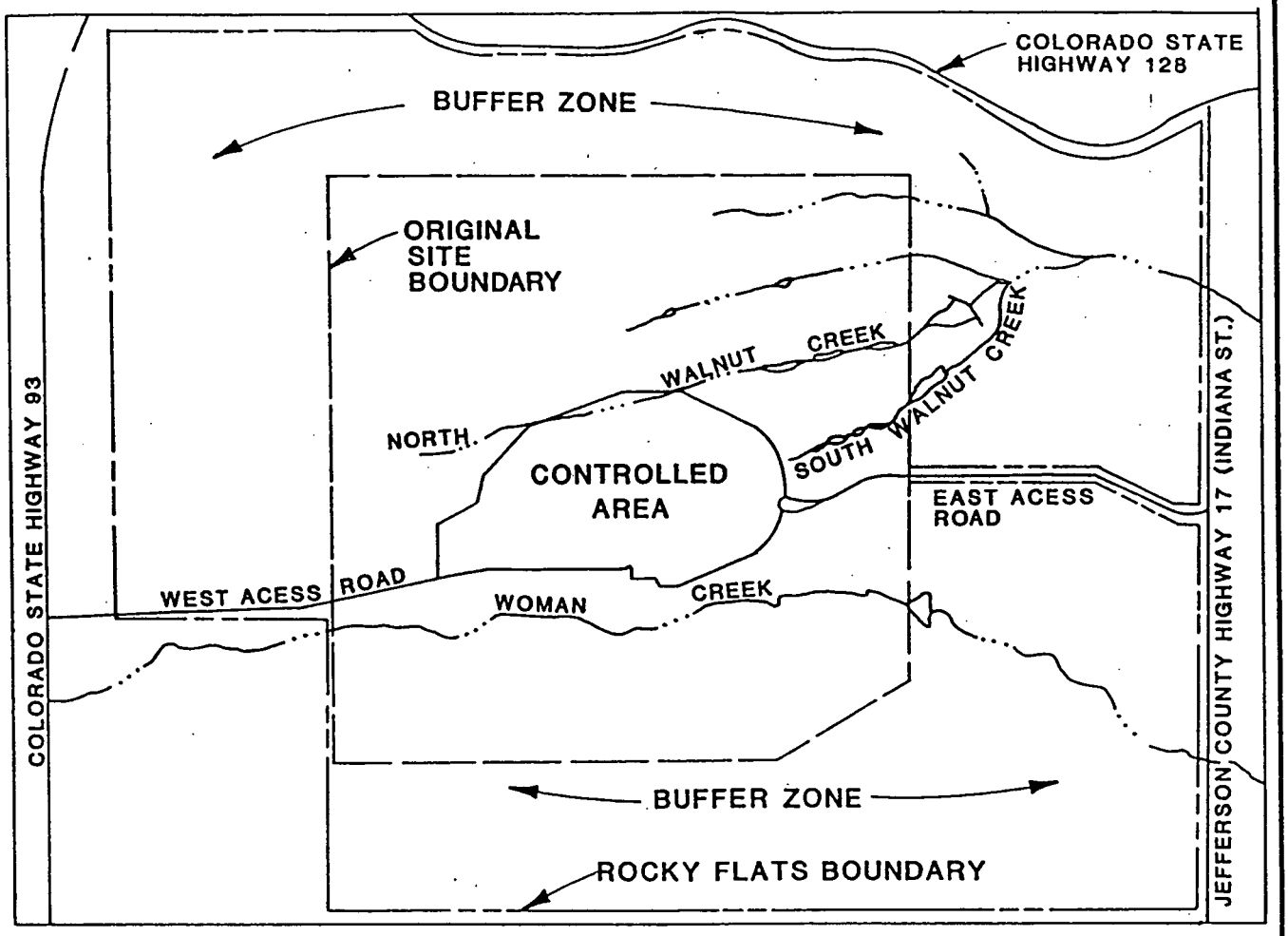
Section 4.0 describes the closure criteria and performance standards to be utilized in evaluating the extent and success of the closure activities. This section includes a discussion of the background criteria, which will guide closure decisions, and presents decision tree diagrams outlining specific closure choices.

The particular steps which will be taken to affect closure of the tanks are discussed in Section 5.0. These steps will address closure activity tasks including removing remaining residues, cleaning surfaces, demolition, offsite disposal, monitoring, and decontamination.

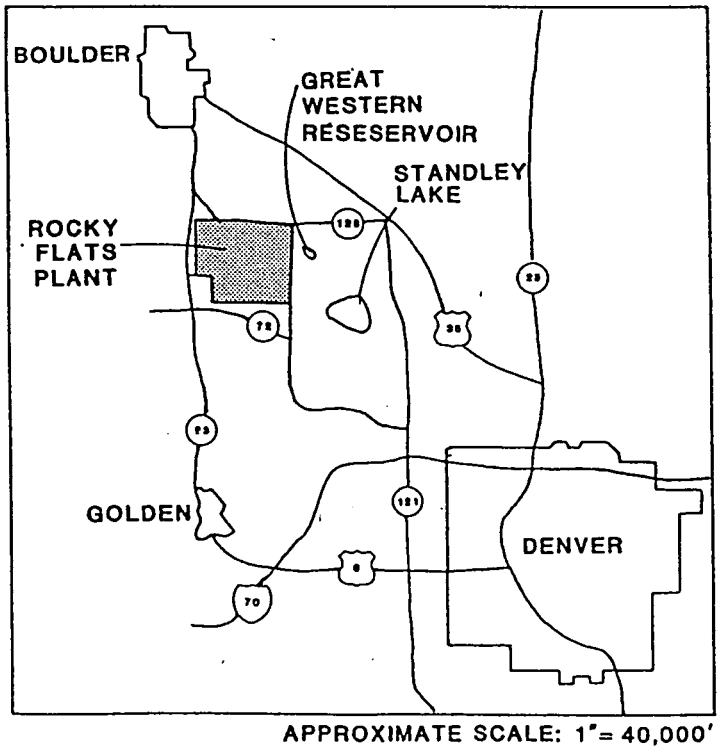
The remaining sections cover closure schedule, financial assurance, health and safety, post-closure, certification, and references. Appendix A presents an environmental media and tank sampling plan.

1.3 PLANT LOCATION AND MISSION

The DOE Rocky Flats Plant is located in north-central Colorado, northwest of the City of Denver as shown in Figure 1.1. The Plant is located in Sections 1 through 4 and 9 through 15 of T1S, R70W. The facility EPA identification number is CO 7890010526. The mailing address is as follows:



APPROXIMATE SCALE: 1"=3,300'



APPROXIMATE SCALE: 1"= 40,000'

SOURCE: ROCKWELL INTERNATIONAL, 1988a

FIGURE 1.1

ROCKY FLATS PLANT

LOCATION MAP

U.S. Department of Energy
Rocky Flats Plant
P.O. Box 928
Golden, CO 80402

The facility contact is Mr. D. Simonson, Manager, Rocky Flats Operations. He may be reached at (303) 966-2025.

Rockwell International has been, and continues to be, the prime operating contractor for the Rocky Flats Plant (since June 1975) which is under the general direction of DOE at the Rocky Flats site. As a government-owned and contractor-operated facility, the Rocky Flats Plant comprises a portion of the nationwide nuclear weapons production complex.

The primary Plant mission is to produce plutonium components for nuclear weapons. Plutonium, uranium, beryllium, and stainless steel parts are fabricated at the Plant and shipped offsite for final assembly. Additional activities include chemical processing to recover plutonium from scrap material, metallurgical research and development, machining, assembly, nondestructive testing, coatings, remote engineering, chemistry, and physics. Waste handling operations at the Plant include storage, transport, treatment, and packaging of waste materials generated onsite. The waste forms that are handled at the Plant include hazardous chemical waste, transuranic (TRU) waste, TRU mixed waste, low-level radioactive (LLR) waste, LLR mixed waste, and non-hazardous, nonradioactive waste. T-40, T-66, T-67, and T-68, which are to be closed under this closure plan, are a part of the waste treatment processes conducted in Building 774.

SECTION 2.0
TANK AND PROCESS DESCRIPTIONS

2.1 TANK LOCATIONS AND DESCRIPTIONS

T-40, T-66, T-67, and T-68 are located in or are directly adjacent to Building 774, which is in the north-central portion of the Rocky Flats Facility (Figure 2.1). Figures 2.2 and 2.3 show the floor plans of Building 774, including the location of these tanks which are a part of Unit 55. T-40 is located in Room 103 in the approximate middle of the building. T-66, T-67, and T-68 are located to the east of Room 241, outside and adjacent to the building. The four tanks will remain in operation until September 30, 1989. New replacement tanks with secondary containment will be installed as shown in Figures 2.4 and 2.5. These new tanks are aboveground units.

2.1.1 T-40

T-40 has been used to store sludge from second-stage precipitation of the liquid process waste from Building 771. It also receives the effluent from a silver recovery unit in Building 774. The tank was constructed in 1963 and is made of concrete that is estimated to be 1-foot thick (Rockwell International, 1988d). The bottom of the tank, when originally constructed, was formed and poured into an area adjacent to the concrete floor of Room 103. The tank sides were also formed and poured separately from the adjoining wall of Room 103. The roof of the tank was repoured and serves as the cement floor of Room 203 (Rockwell Interntional, 1989f). Following construction, T-40 was internally coated with an unknown sealant. No structural data relating to tank construction was found for review purposes.

The tank has an actual capacity of 7200 gallons. As shown in Figure 2.6, the inner dimensions of the tank are as follows: 10 feet 3 inches long, 6 feet 6 inches wide, and 15 feet deep. The two source drawings identified in Figure 2.6 indicate a discrepancy of 3 feet in the tank height. This apparent conflict in the dimensions for T-40 will be rectified during closure activities.

T-40 has eight openings on the tank top that are visible in Room 203. Four of these openings, proceeding from left to right on the north edge of the tank, include an 18-inch diameter manhole with a lift for the decant line installed in the manhole cover; two process liquid lines with a pump installed on the left hand line where the

line enters the tank; and one level alarm. Proceeding along the east side of the tank the remaining openings can be described as follows: one process vent; one pressure differential for the level indicator; and two process waste lines. In addition, a drain line from the tank bottom enters the south wall of Room 103 in the southeast corner.

Tank 40 is constructed with slopes on the bottom so that the flowing liquids will drain. Solids in the liquid settle into the low areas of the tank. The solids on the bottom of T-40 are expected to be difficult to remove. This difficulty arises from the nature of the sludge and the buildup or layering which has occurred over the years of its usage. This tank has been cleaned out periodically using only high pressure water with no chemical aids. The sludge on the bottom has never been completely removed. Visual observation by facility personnel indicate that there are no known cracks or damage to the internal tank walls (Rockwell International, 1989f).

2.1.2 T-66, T-67, and T-68 (60-Series Tanks)

The primary function of T-66 and T-67 is to receive treated liquid decanted from the second-stage batch precipitation process in Building 774. T-68 is used as a backup if T-66 and T-67 are not available. Other uses for T-68 have included receipt via tank truck of aqueous waste from miscellaneous sources such as spills in Buildings 460, 483, and 484 and water overflows on the 904 Pad (Rockwell Interntional, 1989e, and 1989f).

As illustrated in Figure 2.7, T-66 and T-67 are rectangular in-ground tanks with walls of concrete which are 10-inches thick. The two tanks share an inner wall and are capped by concrete at an elevation essentially equal to Room 320 on the north and Room 342 on the west. Both tanks are straddled by a dry chemical storage shed covering approximately two thirds of the tank tops and using the tops as the shed floor. Inner dimensions of both T-66 and T-67 are as follows: 20 feet long, 10 feet wide, and 10 feet 2 inches deep. Each has an actual capacity of 14,000 gallons and a nominal capacity of 12,000 gallons, and may be accessed through individual 2-foot diameter manhole openings at the tank tops. The tank floors are sloped to aid in draining. Both T-66 and T-67 were installed in 1953 and were cleaned, sandblasted, and coated with eight coats of Amercoat No. 55 in 1956 (Rockwell International, 1989e and 1989f).

T-68 is a rectangular, concrete tank located in-ground south of T-66 and T-67 with an actual capacity of 30,000 gallons and a nominal capacity of 28,000 gallons. Construction is similar to that of T-66 and T-67 described previously: the walls are 10-inches thick, the tank top elevation approximates the floors of Rooms 320 and 342, and the floor is sloped. As illustrated in Figure 2.7, T-68 is 16 feet wide, 28 feet 10 inches long and 10 feet 3 inches deep on the inside. The tank has two 2-foot diameter manholes in its top, one in the northwest and the other in the southeast corner. T-68 was constructed in 1959 along with Room 220 in Building 774. Visual observation by Rocky Flats personnel indicate smooth interior walls with no visible cracks (Rockwell International, 1989e). According to available records, no coating was applied to this tank.

Each of the three tanks has two 4-inch diameter fill lines and one 4-inch drain line. Within each tank the drain line has a 90° drop leg ending 6 inches off the tank floor. All piping enters or exits on the west wall of each tank. Because of the design of the drains in the 60-series tanks, approximately 1,000 gallons will remain in the bottom of each tank. The tank bottoms will be a mixture of aqueous wastes and solids which have precipitated from the tank contents. None of the tanks in the 60 series are reported to have been cleaned since coatings were applied. The waste held in the tanks is low in solids content and, therefore, not prone to compaction.

2.2 WASTE GENERATION AND MANAGEMENT

Unit 55 in Building 774 is a liquid waste treatment process which treats and stores TRU aqueous mixed waste piped from production facilities in Building 771. TRU waste is defined by the DOE (1988b) as "Without regard to source or form, waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram (nCi/g) at the time of assay." TRU mixed waste is TRU waste which also contains hazardous constituents or exhibits hazardous characteristics as defined in 6 CCR 1007-3 and 40 CFR Part 261.3.

2.2.1 Waste Generation

The processes that generate the waste destined for treatment in Unit 55 are described in this section and are based on Section C of the Part B permit application (U.S. Department of Energy, 1988a). Knowledge of processes in the production

areas is the basis for the characterization of each of the wastes destined for treatment in Unit 55. The processes in Unit 55 that treat the aqueous waste streams are also described in sufficient detail to characterize the treated waste product and to ensure the compatibility of the wastes entering the treatment process. Table 2.1 presents information on the hazardous characteristics of wastes approved for treatment in Unit 55.

Process knowledge using flow and mass balance calculations provides the basis for identifying waste composition. This is necessary because radiation exposure may result if extensive waste sampling was conducted. Radiation exposure at the Rocky Flats Plant is governed by the "as low as reasonably achievable" (ALARA) principle. This principle provides for exposures that are as low as reasonably achievable and guides all Plant activities.

Materials potentially containing plutonium in levels above the Economic Discard Limit (EDL) are considered to be recoverable residue. Each type of material at Rocky Flats is assigned a specific EDL which is determined based on the cost of recovery and the value of plutonium. EDL's are re-evaluated annually. Materials are only considered waste after they are tested or assayed and determined to have a plutonium content below the EDL.

2.2.1.1 Description of Production Processes

Enriched Uranium Leach: Parts are leached with hot nitric acid and rinsed with water to remove residual acid. Spent nitric acid solution is transferred to the leach acid evaporator. Nitric acid distillate and water condensate are collected from the evaporator and directed to a recovery tank before being sent to Unit 55 for treatment.

Ion Column Effluent: Plutonium recovery from processes such as fast side dissolution, spray leach, slow side dissolution, caustic filtration, and americium recovery is accomplished by ion exchange. These process streams are acidic with nitric acid as the primary constituent. They also contain aluminum nitrate and ferrous sulfamate which in aqueous solutions is converted to ferric ammonium sulfate.

TABLE 2.1
CHARACTERIZATION OF WASTES
APPROVED FOR TREATMENT IN UNIT 55

Process	Transfer Tanks (Bldg. 771)	Waste Composition	Hazardous Characteristics	EPA Hazard Waste No.
Enriched Uranium Leach	1023	Nitric Acid Plutonium Nitrate Americium Nitrate	Corrosivity EP-Tox	D002, D009 D007, D008 D011
Ion Column Effluent	469 975 1014	Nitric Acid Aluminum Nitrate Ferrous Sulfamate Ferric Ammonium Sulfate Ammonium Nitrate Plutonium Nitrate Americium Nitrate	Corrosivity EP-Tox	D002, D006 D007, D008 D011
Fast Side Dissolution	950	Nitric Acid Plutonium Nitrate	Corrosivity EP-Tox	D002, D006 D007, D008, D011
Process Chemistry Technology	208	Nitric Acid Hydrochloric Acid Sulfamic Acid Ascorbic Acid Oxalic Acid Plutonium	Corrosivity EP-Tox	D002, D006, D007, D008, D011
Process Fume Scrubber	714 921 923	Potassium Hydroxide Potassium Nitrate Plutonium & Americium	Corrosivity EP-Tox	D002, D006 D007, D008 D011
Hydro-Fluorination	714	Potassium Hydroxide Potassium Fluoride Plutonium & Americium	Corrosivity EP-Tox	D002, D006 D007, D008 D011
Research and Development	80 81 82	Nitric Acid Sulfuric Acid Ferrous Sulfamate Aluminum Nitrate Plutonium Nitrate Misc. Basic Wastes	Corrosivity EP-Tox	D002, D006, D007, D008 D011

TABLE 2.1 (Continued)
CHARACTERIZATION OF WASTES
APPROVED FOR TREATMENT IN UNIT 55

Process	Transfer Tanks (Bldg. 771)	Waste Composition	Hazardous Characteristics	EPA Hazard Waste No.
Silver Recovery	NA[1/]	Acetic Acid Sulfuric Acid Gluconic Acid Boric Acid Silver	Corrosivity EP-Tox	D002, D011

1/ NA - Not applicable.

Source: Section C, Waste Analysis Plan, Part B Permit Application, TRU Mixed Waste, July 1, 1988 (U.S. Department of Energy, 1988a).

Fast Side Dissolution: Plutonium oxide is allowed to react with nitric acid in the fast side dissolution process. The resulting plutonium nitrate solution passes through an evaporative process. The nitric acid distillate is sent to recovery tanks which are sampled for plutonium. If the plutonium concentration is below the EDL, the liquid is transferred to Unit 55. This waste contains nitric acid and levels of plutonium below the EDL.

Process Technology Development Laboratory: Plutonium recovery process technology development generates small volumes of aqueous waste which vary in composition. Numerous acids are used including nitric, hydrochloric, sulfamic, ascorbic, and oxalic. Chloride and nitrate salts of sodium are present as well as plutonium.

Process Fume Scrubber: The offgas streams coming from slow side dissolution, feed evaporation, fast side dissolution, and peroxide precipitation processes are treated with an aqueous potassium hydroxide solution to neutralize nitric acid vapors and to remove particulates. Steam condensate coming from the evaporator heaters is treated as a TRU waste. When the plutonium level is below the EDL, it is transferred to Unit 55.

Hydrofluorination: Plutonium oxide is converted to plutonium tetrafluoride by reaction with anhydrous hydrogen fluoride. Excess hydrogen fluoride is scrubbed with potassium hydroxide and contains some plutonium. The waste is transferred to a recovery tank and is filtered to recover plutonium. When sampling and analysis indicates plutonium concentration below the EDL, the caustic solution is transferred to Unit 55.

Incinerator Scrubber: The offgas from the incinerator is treated with a caustic spray to neutralize acids. The spent caustic solution is passed through a diatomaceous filter and transferred to a recovery tank. The solution is filtered as part of the plutonium recovery process. After sampling and analysis indicates that plutonium concentrations are below the EDL, the scrubber caustic is transferred to Unit 55.

Silver Recovery: Although the silver recovery process occurs in Building 774, it is considered a generated waste for the purposes of this closure plan. The chemicals used in the recovery process are commercially available and contain

particular acids which are to be considered in this closure. These acids are acetic, sulfuric, gluconic and boric. Waste materials from this process are routed directly to T-40.

2.2.2 Waste Management

Fifteen tanks in Building 771 accumulate aqueous wastes from plutonium processing for 90 days before the wastes are transferred to Building 774. These 13 tanks are shown in Figure 2.8. The wastes from Building 771 are received in Building 774 in batches from these transfer tanks and are treated in a two-stage process. This process, which is also illustrated in Figure 2.8, removes radioactive contaminants from the aqueous waste and immobilizes the resultant sludge for offsite shipment as TRU waste. The resulting effluent is transferred by pipeline to Building 374 for further treatment.

Unit 55 in Building 774 has the capability to treat basic and acidic waste streams containing plutonium and americium. The type of treatment performed depends on the characteristics of the waste received. The aqueous treatment process in Building 774 includes first- and second-stage treatment and sludge solidification. Unit 56, the Organic and Sludge Immobilization System, shares Building 774 with Unit 55, but Unit 56 is not involved in the closure activities described in this document. Unit 57, Miscellaneous Waste Handling, which is also in Building 774, is not connected to the tanks in question, and is not described in this document.

2.2.2.1 First-Stage Treatment

The type of first-stage treatment selected depends on the characteristics of the received waste. Caustic wastes are treated in a precipitation process and filtered to remove radioactive contaminants. Acidic wastes are neutralized prior to precipitation and filtration. Nitric and hydrochloric acids are treated separately.

The caustic precipitation process reduces the plutonium and americium concentration of the caustic wastes (pH from 10 to 13), producing a low specific activity liquid waste. The precipitation process receives caustic waste directly from Building 771 transfer tanks, as well as the caustic filtrate from the filtration system.

Ferric sulfate, magnesium sulfate, and calcium chloride are added to the waste in the flash mixer, T-70. The liquid is thoroughly mixed and the pH ranges between 1 and 12. The liquid waste then flows to the flocculator, T-5, where an anionic polyelectrolyte flocculant is added to enhance agglomeration of the suspended solids. The flocculated mixture flows to the clarifier, C-1, where the solids are settled. The solids are removed by a continuously moving rake at the bottom of the clarifier tank. The clarifier effluent is recycled through the first-stage treatment process before being transferred to the second-stage precipitation process.

Nitric acid waste from Building 771 is received in Building 774 and is treated in T-12. The waste contains large quantities of dissolved metals that are insoluble in basic solutions. Metal hydroxide solids and soluble salts are produced in the waste as a result of neutralization (to an approximate pH of 12) with 50 percent by weight sodium hydroxide. This liquid waste is cooled by a heat exchanger and then is fed to Sludge Tank 210A.

Hydrochloric (HCl) acid waste is currently being received in Building 774 from processes in Building 771. The waste is low in concentration. A new process in Building 771 will eventually come online which will generate HCl wastes with a high concentration. This waste will then feed to the Miscellaneous Waste Handling and Solidification Process (Unit 57) in Building 774.

The hydrochloric acid waste neutralization unit consists of a Kynar-lined receiving tank, T-7, which is resistant to hydrochloric acid corrosion. The hydrochloric acid waste is either neutralized with sodium hydroxide in this receiving tank or is neutralized together with the nitric acid wastes in T-12. The neutralized hydrochloric acid waste is combined with the nitric acid waste in T-12 and treatment follows the procedure outlined above for nitric acid wastes.

2.2.2.2 Second-Stage Treatment

The second-stage batch precipitation process in Building 774 includes T-66, T-67, T-68, T-201, T-202, and T-203. The process is used to further reduce the level of radioactive and chemical contamination from the first-stage precipitation process effluent. T-201 and T-202 receive the effluent from the first-stage precipitation process and operate as batch precipitation tanks. T-203 is used to batch feed Building 374.

Following precipitation, the liquid is decanted from the second-stage batch precipitation process into one of three holding tanks, T-66, T-67, or T-68. Between 2.1 and 2.7 million gallons per year are processed through these tanks. A portion of the waste from these tanks may be used to flush the sludge out of T-201 and T-202. This is indicated in Figure 2.8 with arrows in both directions. The settled sludge is pumped to T-40 which processes up to 270,000 gallons per year. T-40 also receives the effluent from the silver recovery unit in Building 774, which is directly connected by piping to T-40. After the contents have settled, the liquid in T-40 is decanted to the second-stage T-201 or T-202. Waste can be pumped to Building 374 from T-201, T-202, T-203, or T-204. However, T-203 and T-204 are the principal tanks from which the treated waste is shipped.

The sludge in T-40 generated by the treatment process is then pumped to Tank 210-A where it is combined with sludges from the first-stage treatment and fed to the rotary drum vacuum filter which separates the solids. The resultant wet sludge material is solidified with cement in the rotary drum vacuum filter glove box. The filtrate is recycled back into the first stage precipitation process.

2.2.2.3 Other Processes

T-309E and T-309W are used to accumulate floor wash water and water from the decontamination shower from Building 771. The tanks empty directly into T-201 and T-202.

2.3 WASTE CHARACTERISTICS

The processes that generate the waste destined for treatment in Unit 55 were described in Section 2.2. This knowledge of processes in the production areas is the basis for the characterization of each of the wastes destined for treatment in T-40, T-66, T-67, and T-68. The processes in Unit 55 that treat the aqueous waste streams are also described in sufficient detail to characterize the treated waste product and to ensure the compatibility of the wastes entering the treatment process. Table 2.1 presents information on the hazardous characteristics of waste approved for treatment in Unit 55.

As stated in Sections 2.2.1 and 2.2.2 on waste generation and management, T-40, T-66, T-67, and T-68 receive the following wastes which are considered to be hazardous:

- T-40 - Sludge from second-stage batch precipitation and effluent from silver recovery unit;
- T-66 & T-67 - Decant from second-stage batch precipitation; and
- T-68 - Decant from second-stage batch precipitation and aqueous waste spillage from sources such as Buildings 460, 483, and 484.

The sludges and effluents which are in T-40, T-66, T-67 and T-68 have resulted from treatment of hazardous wastes with the following Hazardous Waste Numbers and characteristics:

- D001 - Ignitability;
- D002 - Corrosivity;
- D004 - EP - Toxicity (Arsenic);
- D005 - EP - Toxicity (Barium);
- D006 - EP - Toxicity (Cadmium);
- D007 - EP - Toxicity (Chromium);
- D008 - EP - Toxicity (Lead);
- D009 - EP - Toxicity (Mercury);
- D010 - EP - Toxicity (Selenium); and
- D011 - EP - Toxicity (Silver).

The intermittent aqueous spillage received in T-68 may exhibit, in addition to the above list, the following Hazardous Waste Numbers and characteristics:

- D003 - Reactivity; and
- F009 - Spent stripping solutions from electroplating containing cyanide and exhibiting characteristics of reactivity and toxicity.

Although not identified in the production processes located in Building 771, there are three additional hazardous wastes listed in the Part A permit application (U.S. Department of Energy, 1988a) which might impact Unit 55:

- F001 - Spent halogenated solvents used in degreasing;
- F002 - Spent halogenated solvents; and
- F003 - Spent non-halogenated solvent.

2.4 MAXIMUM WASTE INVENTORY

The maximum waste inventory is equivalent to the maximum capacity of the tanks. The maximum capacities are as follows:

- T-40 - 7200 gallons;
- T-66 and T-67 - 12,000 gallons each; and
- T-68 - 28,000 gallons.

SECTION 3
EXISTING ENVIRONMENTAL CONDITIONS

Ground water and soils near Building 774 have been previously investigated because of contamination problems resulting from the Solar Evaporation Ponds and other contamination sources in the area (Rockwell International, 1988a and 1989b). An overview of this information is presented here as it relates to the closure of the tanks in Building 774. This information should be considered in determining the background levels for use as cleanup criteria for T-40, T-66, T-67 and T-68. This is because contamination due to other potential sources will impose limitations on the level of cleanup which can be achieved during closure of the tanks.

3.1 GROUND WATER

3.1.1 Local Characterization and Existing Quality

The Rocky Flats Plant area is immediately underlain by two hydraulically connected ground water systems. These systems occur in the surficial materials and the underlying bedrock formations. Ground water table elevation data for 1988, which was developed from wells intercepting these systems and for the Solar Evaporation Ponds, are presented in Figures 3.1, 3.2, 3.3, and 3.4. The uppermost bedrock aquifer, known as the Arapahoe, includes various discontinuous sandstone formations.

Previous hydrogeologic investigations (Rockwell International, 1988a and 1989b; Weston, 1988) have shown that ground water in the surficial materials to the east of the tanks is contaminated. The Solar Evaporation Ponds are suspected as the sources for the contaminants which include nitrate, uranium, tritium, and trace metals. The ground water in shallow bedrock also appears to have been impacted by the ponds. However, the extent of ground water quality degradation in this zone is not adequately defined at this time. The report further states that the ground water in deeper sandstone which does not subcrop in the area does not appear to have been affected (Rockwell International, 1989b). None of the wells immediately adjacent to Building 774 are finished in the bedrock aquifer and, therefore, no information is presented here on water quality in this aquifer.

Ground water chemistry data for the alluvial aquifers is summarized here to provide a basis for decisions regarding the background water quality criteria to be used for closure of the tanks in Building 774. The surficial ground water flow in the area of Building 774 is generally to the north and northeast into the Walnut Creek drainage. There is insufficient information to determine whether wells 22-86 and 56-87 to the southeast of the tanks (Figure 3.1) or whether well 19-86 to the west of Building 774 present the most relevant upgradient water quality data (Rockwell International, 1988a). Additional information is needed on the direction of flow of ground water under Building 774 to accurately characterize the existing wells as being upgradient or downgradient of the tanks.

Ground water characterization of the Solar Evaporation Ponds area in 1988 indicates that wells both upgradient and downgradient from the ponds are contaminated. The contamination upgradient from the ponds could not be adequately characterized and statistically accounted for. Ground water quality in the vicinity of the Solar Evaporation Ponds was evaluated by comparing the water chemistry to Plant background water chemistry and to ground water quality criteria.

Well 22-86 is upgradient of the existing Solar Evaporations Ponds and is characterized by the consistent presence of chloroform, carbon tetrachloride, trichloroethene, and other halogenated solvents. Detected concentrations are generally in the hundred to thousands parts per billion (ppb) range. Plutonium is above background level as well. Ground water downgradient of the Solar Evaporation Ponds contains strontium, uranium, and elevated levels of nitrate. The concentrations and types of contaminants from well 22-86 indicate that another source, possibly the original ponds, have impacted the ground water at this well (Rockwell International, 1989b).

Ground water collected from well 56-87 contained chloroform, 1,1,1-trichloroethane, and trichloroethene. No information is available for metals or radionuclides. This contamination indicates the existence of a potential contamination source upgradient from the existing Solar Evaporation Ponds (Rockwell International, 1988a). No information is available on Well 19-86 to the west of Building 774.

3.1.2 French Drain System

The system of french drains north of the area strongly affects the surficial ground water regime. The french drain system has been installed to intercept ground water flowing towards North Walnut Creek. It was installed in the hillside north of the Solar Evaporation Ponds and became operational in April 1981. Figure 3.5 shows the location of the existing french drain system. Figure 3.6 shows a typical cross-section of the drain (Rockwell International, 1988a). The depth of the drains range from approximately 1 to 27 feet (ft) below the ground surface, with a typical depth of 4 to 16 ft. The french drain system supplants a system of interceptor trenches (also shown in Figure 3.1) which was installed in the period from 1971 to 1974. The seepage intercepted by the french drain system flows by gravity into the interceptor trench pump house. The amount of water drained through this system has been estimated at 4 million gallons per year (Rockwell International, 1988a). This amount, however, includes the water collected in the foundation drains of Building 774, which is also piped into the interceptor trench pump house.

It can be hypothesized from the ground water table elevation data for 1988, presented in Figures 3.1, 3.2, 3.3, and 3.4, that shallow soils around T-40, T-66, T-67, and T-68 remain unsaturated throughout the year except for June (Rockwell International, 1989b). If this hypothesis is correct, then it appears that the existing french drain system is effectively collecting the shallow ground water from the area of T-40, T-66, T-67, and T-68, except perhaps during periods of heavy precipitation. However, this interpretation is based on limited number of wells, none of which are close to the tank location.

Evidence indicates that the existing french drain system is not completely effective in containing the contaminated ground water flow from the area of the Solar Evaporation Ponds because contaminated ground water has been detected at wells 17-86 and 15-86 downgradient of the system (Rockwell International, 1989b). These wells are located toward the northeast of the pond area, away from the tanks. Evaluations are being conducted to develop criteria for final design of the ground water collection and treatment system for the Solar Evaporation Ponds, which will address deficiencies of the existing system (Rockwell International, 1988a).

3.2 SOILS

Well 56-87 is upgradient of the Solar Evaporation Ponds, as shown on Figure 3.3. Prior to installation of this well, soil samples were collected within the screened interval. The soil samples contained high concentrations of thallium, cadmium, antimony, and beryllium. It appears that constituents from the original Solar Pond or the original process waste line system may have impacted these soils (Rockwell International, 1989b).

SECTION 4.0
CLOSURE PERFORMANCE STANDARDS AND CRITERIA

T-40, T-66, T-67, and T-68 in Building 774 of the Rocky Flats Plant will be closed under interim status regulations. The hazardous waste management unit closure will be conducted in compliance with 40 CFR 265 and 6 CCR 1007-3, Subpart G, Closure and Post-Closure and Subpart J, Tanks.

4.1 CLOSURE PERFORMANCE STANDARD

The closure activities described in this closure plan are designed to close the tanks in a manner that fulfills the following:

- minimizes the need for further maintenance; and
- controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

4.2 CLOSURE APPROACH

The general approach in this closure plan is to demolish and remove the tanks and any contaminated soils around the tanks within practical limitations. Practical considerations which impose limitations on this closure approach include the location of these tanks relative to Building 774; the presence of other potential sources of contamination in the Rocky Flats facility, complicating the delineation of contamination attributable to the tanks; and the radioactive nature of the waste and the complications it imposes on the methods of tank demolition. If all contamination cannot be removed from the tanks or the surrounding soils, the tanks will be closed in accordance with the closure and post-closure care requirements that apply to landfills as described in 40 CFR 265.197(b).

If the tanks are closed as landfills, there will be no danger to the environment. Pathways for transport of contaminants into the ground water system probably will not exist for three primary reasons:

(1) Building 774 and, if necessary, a low permeability cover, will eliminate infiltration into the contaminated soils;

(2) A ground water collection system will depress the ground water table in the surficial materials in the affected area to a level below the bottom elevation of the tanks;

(3) A ground water collection system will intercept and collect the ground water downgradient from the tank location for treatment before discharging it to the environments.

Monitor wells will be installed to verify that the existing ground water collection satisfies items (2) and (3) above. If the existing system is insufficient, improvements to or extension of the existing system will be carried out as discussed in Section 5.0. When Building 774 itself is closed, the remaining tanks and/or contaminated soils (if any) will then be closed in the same manner as the rest of the building, as described in the Part B Permit for TRU Mixed Waste, Closure Plan (U.S. Department of Energy, 1988a).

4.3 CLOSURE PERFORMANCE CRITERIA AND OPTIONS

Because of the radioactive nature of the wastes contained in T-40, T-66, T-67, and T-68, both the RCRA-listed constituents and the residual radionuclide levels are included in the closure performance criteria. Criteria regarding residual radionuclides follow DOE policies and guidelines, as well as established Rocky Flats procedures. Residual radionuclides are not subject to RCRA regulation.

Table 1 of Appendix A presents all known and suspected RCRA hazardous constituents which might have been placed in the tanks and is based on existing information. The waste characterization program to be conducted at the initiation of closure activities may add to this list. During closure, decisions regarding whether to continue tank cleaning and soil excavation will be determined based on a shorter indicator list of analytes. Table 2 of Appendix A presents a possible example of this list. A long list of analytes, including the hazardous constituents in Table 1 of Appendix A, will be used to determine if clean closure is achieved.

The existing contamination levels (RCRA-listed constituents), as well as the remaining contamination levels after tank cleaning, will be assessed on the basis of the local background concentrations. Local background concentrations will be

determined independently for each type of sample (e.g., soils and ground water) and will be based on samples taken in appropriate locations as described in this section. The four types of samples to be taken include the following:

- final aqueous rinsate;
- concrete chips or cores from tank walls;
- soils under and around the tanks; and
- ground water under the tank area.

The background samples for the rinsate will be taken from the rinsate water source before it enters the tanks. The local background samples for the concrete will be taken from an upper portion on the outside of the appropriate tank away from any fill or exit pipes or openings.

The concentrations of metals and radionuclides in background soils are reported in the Solar Pond Closure Characterization Report (Rockwell International, 1988a). These values were obtained from composite samples from the top 1 foot of Rocky Flats Alluvium in the West Buffer Zone and are presented in Table 4.1. As a part of this closure plan, a soil characterization program will also be carried out to define the "local" background concentrations in the soils around Building 774 unlikely to have been affected by the tanks. This will provide a basis for assessing the effects of other potential sources of contamination in the area. If the results of this soil characterization plan show that other potential sources of contamination might have had a substantial impact on the tank site soils, the local background concentrations will be used as the cleanup criteria.

The local background sample for ground water will be taken from a new or existing upgradient ground water well.

4.4 T-40

Two alternatives will be considered for closure of T-40.

- Alternative 1 - Remove wastes and waste residues from the tank, clean and decontaminate the tank, seal the inner surface of the tank, fill with inert material, and leave the tank in place.

TABLE 4.1

METAL AND RADIONUCLIDE CONCENTRATIONS IN BACKGROUND SOIL[1/]

Metals	Concentration (mg/kg)
Aluminum	6,540 - 9,140
Antimony	41U[2/]
Arsenic	6.1U - 10
Barium	135U
Beryllium	3.4U
Calcium	2,500U
Cadmium	3.4U
Chromium (Total)	5.6 - 13
Cobalt	12U - 25
Copper	12U
Iron	9,080 - 12,400
Lead	15 - 48
Magnesium	2,500U
Manganese	196 - 337
Mercury	0.1U
Nickel	20U
Potassium	2,500U
Selenium	3.4U
Silver	5U
Sodium	2,500U
Thallium	6.8U
Tin	41U
Vanadium	30U - 38
Zinc	20 - 49

Radionuclides	Concentration (pCi/g)	
Plutonium[4/]	0.01 (0.10)[3/] - 0.10 (0.20)	0.10 ± 0.10
Americium[4/]	-0.02 (0.03) - 0.28 (0.16)	
Uranium 233+234	0.66 (0.16) - 1.4 (0.20)	
Uranium 238	0.62 (0.16) - 1.2 (0.2)	
Tritium[5/]	-70 (220) - 280 (270)	

1/ Background values based on nine composite samples collected from the top foot of Rocky Flats Alluvium in the West Buffer Zone.
2/ U - Values less than detection limits.
3/ Values in parentheses indicate counting uncertainty.
4/ Isotope numbers are not given.
5/ Tritium is in units of pCi/l of soil water.

Source: Rockwell International, 1988a.

- Alternative 2 - Remove wastes and waste residues from the tank, clean and decontaminate the tank, seal the inner surface of the tank, fill with inert material and leave the tank in place. Install a ground water collection and treatment system to ensure that no contaminants leave the site.

Alternative 1 is applicable if the Environmental Media and Tank Sampling and Analysis Program (Appendix A) shows that the tank is completely decontaminated, and no soil contamination exists around the tank. If there is no evidence of soil contamination, it is unlikely that the tank has contributed to ground water quality degradation in the area. This alternative leads to an in-place clean closure of the tank.

Alternative 2 will be pursued if the sampling and analysis program shows that some contaminants remain on or inside the tank walls and/or soil contamination exists around the tank. The tank will be left in-place for two primary reasons. First, an operation to demolish and remove the tank would likely create a significant radiation risk for workers carrying out the demolition that is greater than the environmental benefits of removing the tank. Second, tank removal might negatively impact the integrity of the building foundation. Figure 4.1 shows the placement of T-40 with respect to Building 774's foundation. As shown, the tank is located on the lowest level of the building, and three of its four vertical walls are in contact with the foundation soil. Attempts to demolish the tank wall would probably require stabilization of the surrounding soil to prevent undermining of the building foundation and would require further geotechnical investigation. Removing the tank debris would be difficult since there are no readily available accesses to the tank location.

Figure 4.2 shows the flow chart of the closure activities and decisions necessary to implement either alternative (specific closure activities are discussed in Section 5). The selection of the appropriate closure alternative for T-40 will depend on whether the tank and the surrounding soils are found to be contaminated during the closure activities presented in the flow chart. Contamination will be assessed on the basis of background concentrations, accounting for the inherent variability of such measurements. The performance criteria for making these decisions are presented in Table 4.2.

TABLE 4.2

PERFORMANCE STANDARDS FOR CLOSURE

T-40

Type of Contamination	Clean Closure In-Place	Clean In-Place With Ground Water Monitoring, Collection And Treatment
Tank		
RCRA-Listed Constituents	≤ "Local" Background	> Local Background
Residual Radionuclides	≤ 20 pCi/gm TRU ≤ 100 nCi/gm	> 20 pCi/gm
Piping		
RCRA-Listed Constituents	Concentration of Constituents Not Greater Than Influent	Rinse Water Different From Influent
Residual Radionuclides	NA	NA
Soil		
RCRA-Listed Constituents	≤ Background or "Local" Background	> Background or "Local" Background
Residual Radionuclides	≤ 20 pCi/gm	> 20 pCi/gm

NOTE: Residual radionuclides level is for plutonium and americium combined.

4.5 60-SERIES TANKS

T-66, T-67, and T-68 will be cleaned and decontaminated after they are taken out of operation. They will then be demolished and the debris shipped offsite for disposal. Figure 4.3 shows the flow chart of the closure activities and decisions according to this plan. The closure activities will be discussed in Section 5.0.

The contamination remaining on the tank debris after cleaning and decontamination will determine the debris disposal method. The debris will be analyzed to determine if it is a hazardous waste according to RCRA. The contamination of the surrounding soils will be assessed on the basis of the local background concentrations, accounting for the inherent variability of such measurements. The contamination level in the soils will determine whether and what amount of the soils will be removed. Table 4.3 presents the performance criteria for making these decisions.

If contaminated, soils will be removed to the extent limited by the vicinity of Building 774 and its foundation. If any contaminated soils are allowed to remain, the tank site will be closed as a landfill. A low permeability cover will be provided, if warranted. A ground water monitoring, collection, and treatment system will also be installed or the existing system will be supplemented to ensure that no contaminants leave the tank site.

TABLE 4.3
CLOSURE PERFORMANCE CRITERIA
T-66, T-67 & T-68

Type of Contamination	Remain in-Place	Removal & Disposal as LLR Waste	Removal & Disposal as LL Mixed Waste	Removal & Disposal as TRU Waste	Removal & Disposal as TRU Mixed Waste
Tank					
RCRA-Listed Constituents	NA	Core Samples Pass EP-Tox, Organics Analysis	No Limits	NA	No Limits
Residual Radionuclides	NA	> 20 pCi/gm TRU ≤ 100 nCi/gm	> 20 pCi/gm TRU ≤ 100 nCi/gm	TRU > 100 nCi/gm	TRU > 100 nCi/gm
Piping					
RCRA-Listed Constituents	NA	Concentration of Constituents Not Greater than Influent Water	No Limits	NA	No Limits
Residual Radionuclides	NA	> 20 pCi/gm TRU ≤ 100 nCi/gm	> 20 pCi/gm TRU ≤ 100 nCi/gm	TRU > 100 nCi/gm	TRU > 100 nCi/gm
Soil					
RCRA-Listed Constituents	Core Samples ≤ "Local" Background	Samples Pass EP-Tox, Organics Analysis	Samples Fail EP-Tox, Organics Analysis	Samples Pass EP-Tox, Organics Analysis	Samples Pass EP-Tox, Organics Analysis
Residual Radionuclides	> 20 pCi/gm	> 20 pCi/gm TRU ≤ 100 nCi/gm	> 20 pCi/gm TRU ≤ 100 nCi/gm	TRU > 100 nCi/gm	TRU > 100 nCi/gm

NOTE: Residual radionuclides level is for plutonium and americium combined except when indicated otherwise.

SECTION 5.0
CLOSURE ACTIVITIES

5.1 WASTE CHARACTERIZATION PROGRAM

Prior to the commencement of tank cleaning, a waste characterization program will be carried out for T-40, T-66, T-67, and T-68. The program will include sampling of liquid and solid wastes in each tank for analysis of their constituents. The purposes of this program are twofold: (1) to confirm that the selected indicator parameters, listed in Tables 1 and 2 in Appendix A, are adequate for describing the potential contaminants from T-40, T-66, T-67, and T-68; and (2) to provide an indication of the treatment processes required for the wastes which will be generated through the cleaning processes. If the analytical results show that the samples contain waste types not well represented by the selected indicator parameters, additional indicator parameters will be selected and added to the list.

The existing treatment system within Building 774 is capable of treating the following EPA hazardous waste types: F001, F002, F003, and D001 through D011. If the analytical results show that the samples contain other waste types, alternative treatment techniques will have to be considered. Should treatment of cyanides (F009) be necessary, the treatment system in Building 374 can be utilized.

The waste characterization program is not expected to definitively identify all the potential contaminants. It is recognized that the waste samples will represent only the recent operation of the tank, and not necessarily the operation over the entire life of the tank.

5.2 SOIL CHARACTERIZATION

A soil characterization program will also be conducted at the same time as the waste characterization program. Soil samples will be collected in the immediate area surrounding T-66, T-67, and T-68. These samples will be analyzed for the presence of metals, radionuclides, and organics. The Environmental Media and Tank Sampling and Analysis Plan in Appendix A discusses the soil sampling program.

5.3 REMOVE WASTES AND WASTE RESIDUES

Because of the existing piping and process scheme, T-66, T-67, and T-68 will be cleaned before the commencement of the cleaning operation of T-40. Temporary piping and pumps might be required for the cleaning process. The first step in cleaning each of the tanks is to ensure that no wastes from the process waste system can enter the tank. This can be accomplished by methods such as blind flanging the tank inlet or closing and locking the existing inlet valves.

The sludge and visible waste residues in each tank will be removed with the use of mechanical tools and/or high pressure water jet. The waste slurry from T-66, T-67, and T-68 will be drained through the existing piping system to T-40. From T-40, the slurry will continue on to the vacuum filtration and cementation processes. The cementation process is carried out in a glovebox. The end product of these processes will be solidified waste which will be temporarily stored onsite while awaiting shipment offsite for disposal at a permitted waste storage or disposal facility.

5.4 SPRAY AND CIRCULATE CLEANING SOLUTIONS

After the sludge and visible waste residues have been removed, each tank and associated piping system will be cleaned by spraying the inner surfaces of the tank with one or more cleaning solution(s) and circulating the cleaning solution(s) through the piping system.

As an example, 2,500 gallons of a virgin cleaning solution will be sprayed onto the inner surfaces of the tank. Spraying can be accomplished through the use of a rotating spray nozzle, which can direct the spray in all directions, or other appropriate types of nozzles. Upon completion, the inlet piping will be unblocked. The cleaning solution in the tank will then be circulated through the associated inlet and outlet piping. This circulation is intended to flush the piping system and should continue for at least 1 hour. Upon completion, the cleaning solution will be pumped to the appropriate aqueous waste treatment system in Building 774 or Building 374.

Spraying and circulation may be repeated with the same or other cleaning solutions to remove specific constituents. The selection of the cleaning solution(s) will be made on the basis of the results of the waste characterization program. For contaminants consisting of solvents, organics, ionic metals and inorganic acids,

commercially available cleaners, such as trisodium phosphate, may be used. For non-acidic inorganics, basic solutions, such as sodium hydroxide, or bleaches, such as calcium hypochlorite, may be used. One percent solutions of concentrated acid can be used for decontaminating caustic type wastes. Mixed and TRU mixed wastes have been successfully cleaned by "Simple Green," a commercially available product. Potable water will be used in the final round of spraying and circulation.

5.5 STEAM AND SUCTION CLEANING TECHNIQUE (T-40)

After the completion of spraying and circulation of cleaning solutions, the concrete walls of T-40 will be further decontaminated by application of steam and suction. This step is considered unnecessary for T-66, T-67, and T-68 because the tanks will be removed.

This cleaning technique will be applied from inside the tank. Superheated water will be applied at the tank surfaces in conjunction with a suction pressure of about 36 pounds per square inch (psi). The superheated water will convert to steam just above the wall surface and will be removed by the suction pressure together with the contaminants from the surface and the pores of the concrete tank wall. This technique will be repeated until the performance criteria for the tank surface, as indicated in Table 4.2, are satisfied or until the results show that additional cleaning has become ineffective. An apparatus for this cleaning technique is manufactured by the Nuclear Fuels Division of Babcock Wilcox. This cleaning procedure will require personnel to enter the tank.

5.6 SAMPLING AND ANALYSIS PROGRAM

5.6.1 Tank Sampling Program

The initial portion of the sampling program will be directed at the tank wall only. No coring of the tank wall will be performed as this might allow spill of wastes generated by the cleaning processes into the soils.

The tank wall sampling will include wipe and chip samples of concrete as discussed in Appendix A. All wipe samples will be analyzed for removable

radionuclides. The concrete fragment samples will be analyzed for residual radionuclides (americium and plutonium), silver, and any other indicator parameters selected in the waste characterization program.

5.6.2 Core Sampling and Analysis of Concrete and Soils

The next stage of the sampling program will involve core sampling of the concrete tank walls in the tank and sampling of the adjacent soils. This will be performed after the determination that additional cleaning will be ineffective and, thus, unlikely to take place.

Samples will be taken near the four corners of T-40, as well as around any visually identifiable cracks.

For T-66, T-67 and T-68, the concrete samples can be taken before, during, or after demolition. Sampling can be performed with coring, chipping, or other techniques. The adjacent soil will be sampled with a sampling spoon and/or a hand-operated auger. The concrete and soil samples will be analyzed for residual americium, plutonium, silver, and other indicator parameters identified in Table 1 of Appendix A, Environmental Media and Tank Sampling and Analysis Plan. The results of the concrete and soil sampling program will categorize the tank and piping debris and the soils as one of the following types of wastes:

- LLR waste;
- LLR mixed waste;
- TRU waste; and
- TRU mixed waste.

The waste type will in turn determine the disposal site and the shipment package requirements.

5.7 ISOLATION OF T-40

Following sampling, isolation of T-40 will be accomplished by sealing the inner surfaces of the tank with appropriate concrete sealants to prevent flow in and

out of the tank. Cleaned and disconnected piping may be placed inside the tank. The tank will then be filled with sand, concrete, or other inert solids, which will prevent any mistaken uses of the tank.

5.8 ADDITIONAL CLOSURE STEPS FOR 60-SERIES TANKS

5.8.1 Tank Demolition

As shown in Figure 2.2, existing engineering drawings (U.S. Atomic Energy Commission, 1967) indicate that the north wall of Tank 66 abuts, but is separated from, the interior wall of Room 220 in Building 774. This will be verified prior to the commencement of this activity.

Tank demolition will follow dismantling of the existing storage shed and parts of the existing retaining walls illustrated in Figure 5.1. Some excavation of the soils around the top of the tanks might also be necessary, particularly on the south side of T-68, to prevent soil instability once the tank walls are removed. These soils will be temporarily stored in containers and will be sampled to determine the appropriate disposal methods.

The concrete tank walls will be cut with saws or broken into pieces. Appropriate measures will be taken to control dust during this operation, including the uses of temporary site enclosure and air filtration. The size of the concrete pieces will be appropriate for the type(s) of containers required for shipment (Section 5.8.3). The concrete pieces will then be loaded into the containers for later shipment.

5.8.2 Remove Contaminated Soils Around and Below Tanks

After the tanks have been demolished and removed, the soils around and under the original tank locations will be removed in layers approximately 6 inches in thickness. The soils will be removed until the performance standards in Table 4.3 for remaining in-place are satisfied or until all the soil in the accessible zone has been removed. The accessible zone will be defined as the zone which is within 5 feet of any of the tank walls and within 5 feet in depth from the soil surface, but which does not extend laterally beyond or below any interior walls of Building 774, and which will not negatively impact the foundation integrity of Building 774.

The excavated soils will be temporarily stored in containers for later disposal. If this operation is carried out in periods of heavy precipitation, dewatering wellpoints will be installed around the excavation area to depress the ground water table. Ground water collected in this manner will be piped to the interceptor trench pump house shown in Figure 3.5.

5.8.3 Offsite Shipment for Disposal

The tank and piping debris and contaminated soils will be packaged into containers, such as steel boxes and drums or specialized truck trailers, appropriate for the waste classification. The LLR wastes and the LLR mixed wastes will be shipped to Beatty, Nevada for disposal. The TRU wastes will be temporarily stored in containers onsite or at the Idaho National Engineering Laboratory (INEL) for later disposal at the WIPP (Waste Isolation Pilot Plant) in New Mexico when it becomes available.

5.8.4 Backfill Area and Provide Cover

The original tank location will be backfilled with clean soils and compacted and graded to conform with the surrounding area and Building 774. The top surface will include at least a 3 percent slope away from Building 774 for drainage. Parts or all of the surface area will be paved, while the remaining area will be revegetated.

If some contaminated soils remain under the original tank location outside of the Building 774 foundation, a low permeability cover will be provided over the area previously occupied by the tanks. This cover will include a 2-foot clay liner and one or two layer(s) of flexible membrane liners. The cover will be designed to prevent infiltration between itself and the adjacent parts of Building 774. The contour of the cover will conform to the surrounding area and Building 774. The final ground surface above the cover will be treated in the same manner as described in the above paragraph.

5.9 ACTIVATION OF GROUND WATER COLLECTION, TREATMENT, AND MONITORING SYSTEMS

To ensure that T-40 and any remaining contaminated soils will not cause degradation of the ground water quality, the area around the tank and soils will be provided with the following: (1) a monitoring program based on existing and

proposed new monitor wells (see Section 9.0); (2) an analysis program to identify the ground water table and the presence of contaminants attributable to the tank and existing RCRA units near the tanks; and (3) a ground water collection and treatment system which will intercept and collect the ground water downgradient from the tank for treatment before discharging it to the environment.

The area around T-40, T-66, T-67, and T-68 is serviced by an existing french drain system, which has been installed in the hillside north of the Solar Evaporation Ponds and to the northeast of Building 774. As presented in Section 3, the french drains range from 1 to 27 feet in depth below ground surface with a typical depth of 6 to 16 feet. It has been inferred from quarterly data for 1988 that the surficial materials around the tanks remain unsaturated throughout the year except for June (Rockwell International, 1989b).

The seepage intercepted by the French drain system flows by gravity into the interceptor trench pump house. The water collected in the foundation drains of Building 774 is also piped into the interceptor trench pump house. The total amount of water drained through this system has been estimated at 4 million gallons per year (Rockwell International, 1988a). The collected ground water is presently discharged into the Solar Evaporation Ponds. A ground water treatment system is expected to come into operation in 1991. The system is considered applicable and adequate for this closure activity.

It is possible that the monitoring program will show that the existing french drain system is adequate for preventing ground water from leaving the tank site. However, if monitoring efforts indicate that the existing system is inadequate, one or a combination of the following actions will be taken:

(1) The pumping rate from the existing system will be increased during periods of heavy precipitation; and/or

(2) The french drain system will be extended.

5.10 DECONTAMINATION OF EQUIPMENT

5.10.1 Cleaning Equipment

Equipment used in the tank cleaning process will be washed down in the tanks. Additional decontamination will be conducted in accordance with standard

Rocky Flats procedures. Rinse water will be collected in approved containers for treatment in Buildings 374 or 774.

5.10.2 Construction Equipment

Construction equipment to be used during closure may include tools, backhoes, large front end loaders, small loaders, scrapers, graders, haul trucks, and forklifts. If the tank and soil testing and analysis program indicates that the tanks remain contaminated after the cleaning process or that the soils are contaminated, all construction equipment will be decontaminated according to standard Rocky Flats procedures.

SECTION 6.0
CLOSURE SCHEDULE

T-40, T-66, T-67 and T-68 will stop receiving waste on September 30, 1989. These tanks are being closed because they do not meet the requirement for secondary containment contained in 6 CCR 1007-3 Section 264 and 40 CFR 264.

The closure schedule requirement for the removal of waste from the tanks and for the completion of all closure activities cannot be met. Colorado and Federal regulations require the closure to be completed within 180 days of the final receipt of wastes or 180 days after approval of this closure plan. This 180-day limit cannot reasonably be met for three major reasons:

- the difficulty which may occur in removing waste residuals;
- the iterative nature of cleaning and sampling the tanks as described in Section 4; and
- the care that needs to be taken to protect personnel performing closure activities from hazardous and radioactive materials.

It is estimated that closure activities can be completed by March, 1992 or 2.5 years following state approval of this closure plan, whichever is later.

The closure schedule will include the following milestones for key closure activities:

- Waste sampling and waste removal - 9 months following closure plan approval;
- Tank inner surface decontamination - 15 months following closure plan approval; and
- Installation of required monitoring and treatment - March, 1992 or 2.5 years following closure plan approval, whichever is later.

A certification of closure will be submitted to the CDH within 60 days of the completion of final closure. At the same time a survey plat will be submitted to the local zoning authority and to the CDH showing the location and dimensions of hazardous waste disposal units and all other required information.

SECTION 7.0
CLOSURE COST AND FINANCIAL ASSURANCE

State and Federal governments are exempt from the financial requirements imposed by Subpart H of 6 CCR 1007-3, Section 265.140(c). Because the Rocky Flats Plant is a federally-owned facility, no cost estimates or financial assurance documentation is required.

SECTION 8.0
HEALTH AND SAFETY

A Health and Safety Plan (HASP) is required for all hazardous waste sampling sites. It is intended to contain information pertinent to field assignments and to be a guide during an unusual situation or emergency. A HASP for the closure of T-40, T-66, T-67, and T-68 will be developed by Rockwell International approximately 2 months before initiation of closure activities. The plan will comply with all Occupational Safety and Health Administration (OSHA), CDH, EPA, and DOE regulations.

Documents which outline the overall worker health and safety policy at the Rocky Flats Plant will be used as the basis for this HASP. These documents include the following:

- Nuclear Safety Manual;
- Material Hazards Manual;
- General Plant Rules; and
- Health, Safety, and Environmental Manual.

Some of the general training and safety requirements anticipated are outlined below.

8.1 CONFINED SPACE ENTRY

Confined space entry procedures that pertain to the tanks are outlined in the Rocky Flats' Health, Safety, and Environmental Manual. These procedures will indicate the clothing, equipment, and monitoring activities necessary to protect personnel during tank cleaning and decontamination.

8.2 PERSONNEL TRAINING

A number of training courses may be required for personnel performing the closures. The required courses and activities are as follows:

- OSHA-approved, 40-hour, Hazardous Waste Worker Training or Rockwell-approved, 24-hour, basic waste-site health and safety training;

- Cascade and escape-pack training (Rockwell);
- Self-contained breathing apparatus (SCBA) training (Rockwell);
- Radiation worker training (Rockwell);
- Confined space entry training; and
- A three-day, on-the-job training session under the supervision of an experienced person before full responsibilities may be assumed; first aid training is desirable, but not mandatory, for work on the Rocky Flats Site. In addition, all personnel are required to have reviewed the HASP for closure of the four tanks.

8.3 STANDARD SAFETY PROCEDURES

The following safety procedures will apply each time personnel make a site entry for sampling purposes.

- No personnel will be at the site without a designated "buddy".
- One of the people entering the site will be designated to be in charge.
- Personal protective equipment will be worn as specified (based on site conditions). Approved deviations will be entered in the field logbook and signed by the field team leader (cognizant engineer) and the site safety officer.
- Field work will be planned prior to site entry.
- Equipment needed for work will be inventoried and inspected prior to the site visit to ensure that all equipment is present and in operable condition.

SECTION 9.0
POST-CLOSURE PLAN

A post-closure plan is required as a part of a closure plan for hazardous waste tanks without secondary containment. A site-specific post-closure plan has not been developed. In the event that clean closure cannot be achieved for either T-40 or the site of the 60-series tanks, a post-closure plan will be submitted which includes the features outlined below.

Post-closure care will follow the requirements outlined in 6 CCR-1007-3, Part 265.117. T-40 will be isolated from building 774 to prevent possible disturbance. If a low permeability cover is provided for the site of the 60-series tanks, future use of the area will not be allowed to damage or disturb the cover.

Post closure monitoring for either T-40 or the 60-series site will follow 6 CCR 1007-3, Subpart F, Ground Water Monitoring. One upgradient and three downgradient monitoring wells will be installed at the tank site during closure. Ground water samples will be taken from these wells and analyzed for contamination. The frequency of sampling and analysis will be quarterly for the first year and semi-annually thereafter.

SECTION 10
CLOSURE CERTIFICATION

Certification of Closure, which is outlined in 6 CCR 1007-3, Section 265.115 and 40 CFR 265.115, requires that the owner or operator and an independent registered professional engineer submit a certification that the tanks have been closed in accordance with the specifications outlined in the closure plan. To fulfill this regulatory requirement, T- 40, the 60-series tanks, and areas impacted by the tanks will be inspected by a registered professional engineer throughout the closure process. In addition to these inspections, the engineer will review the results of closure-related chemical analyses to evaluate the effectiveness of the implemented closure plan .

T-40 will require inspections by an independent registered professional engineer during and/or after completion of the following closure activities:

- Removal of tank wastes and residues;
- Decontamination of the tank and associated piping;
- Sealing of the tank's interior surface; and
- Filling of the tank with an inert material.

The 60-series tanks, tank debris, and related media will be examined during and/or after the following steps:

- Removal of tank waste and residues;
- Decontamination of each tank's interior surface and associated piping;
- Tank demolition and preparation of debris for shipment;
- Removal and disposal of contaminated soil; and
- Construction activities to install a cover over the remaining contaminated soil, if needed, and to backfill and regrade the tank area.

A summary of these closure activities and documentation that the tanks have been closed as outlined in the closure plan (e.g., analysis results and hazardous waste manifests) will be provided in a certification report. Any deviations from the closure plan and the resolution of these deviations will also be documented in this report. The certification report will be signed by the owner/operator and an

independent registered professional engineer and sent by registered mail to the CDH and the EPA Regional Administrator within 60 days following closure of the last tank.

REFERENCES CITED

Rockwell International. 1986. Site Utility Plans Legend Sheet. Drawing Number D15501-2, Issue M. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1988a. Resource Conservation and Recovery Act Post-Closure Care Permit Application for USDOE - Rocky Flats Plant Mixed and Radioactive Mixed Waste - Volume V, Solar Evaporation Ponds Closure Plan. Rockwell International, North American Aerospace Operations, Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1988b. Building 774, First, Third, and Fourth Floor Plans, Drawing Number D30774-2, Issue F. Rocky Flats Plant, Golden, Colorado.

Rockwell International, 1988c. Building 774, Second Floor Plan, Drawing Number D30774-1, Issue G. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1988d. RCRA Permit Drawing Application, 2nd Stage Sludge Tank, T-40, Drawing Number D37810-333, Issue A. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1988e. T-66, T-67, and T-68 Holding Tanks Plans and Sections, Drawing Number D37807-003, Issue B. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1989a. Replace Tank T-40, Building 774 Floor Plans, Drawing Number D38543-200, Issue I. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1989b. 1988 Annual RCRA Ground-Water Monitoring Report for Regulated Units at Rocky Flats Plant, Volume I. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1989c. Material Safety Data Sheets for Silver Recovery System, Building 774. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1989d. Platform Framing and Pipe Support Plan, Drawing Number D38544-303, Issue A. Rocky Flats Plant, Golden, Colorado.

Rockwell International. 1989e. Personal Communication. Building Manager, Building 774. Rocky Flats Plant, Golden, CO

Rockwell International. 1989f. Personal Communication. Acting Operations Manager, Building 774. Rocky Flats Plant, Golden, Colorado.

U.S. Atomic Energy Commission. 1967. Waste Disposal Facility Concrete Foundation Plans and Details, Drawing Number D14774-1, Revision C. Rocky Flats Area Office, Golden, Colorado.

U.S. Atomic Energy Commission. 1974a. Site Plan-Building 774, Drawing Number D23542-101, Issue A. Rocky Flats Area Office, Golden, Colorado.

U.S. Atomic Energy Commission. 1974b. Key Plan - Building 774, Drawing Number D23540-204, Issue A. Rocky Flats Area Office, Golden, Colorado.

U.S. Department of Energy. 1988a. Part A and Part B Permit Applications for TRU Mixed Waste at Rocky Flats Plant. Rocky Flats Plant, Golden, CO.

U.S. Department of Energy. 1988b. Radioactive Waste Management. DOE Order 5820.2A. Office of Defense Waste and Transportation Management, Washington, D.C.

U.S. Department of Energy. 1988c. Radiation Protection of the Public and the Environment. DOE Order 5400.xx. Office of Environment and Health, Washington, D.C.

Weston, Roy F. 1988. Solar Evaporation Ponds Hydrogeologic Characterization Report, Rocky Flats Plant, Golden, Colorado. Prepared for Rockwell International, Aerospace Operations, Rocky Flats Plant.

Westinghouse Electric Corporation. 1981. TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant. WIPP-DOE-069, Revision 1.

APPENDIX A
ENVIRONMENTAL MEDIA AND TANK SAMPLING AND ANALYSIS PLAN

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APPENDIX A
ENVIRONMENTAL MEDIA AND TANK SAMPLING AND ANALYSIS PLAN T-40, T-66, T-67, AND T-68

1.0 INTRODUCTION

This plan describes sampling and analysis of environmental media and tank surfaces that will occur during closure of tanks T-40, T-66, T-67, and T-68. This plan does not include the initial waste characterization program that may be undertaken to determine what hazardous constituents are present in the tanks at the time closure activities begin. Information from the waste characterization program will be used to augment the hazardous constituents analyzed for in this plan. This plan also does not describe a background soil characterization program that will be conducted at the same time as the waste characterization program. The soil characterization program will involve collection of soil samples from the area of Building 774, and collection of additional samples from the West Buffer zone of the Rocky Flats Plant, as necessary for statistical analysis purposes. The use of this data will be discussed in Section 3.0 of this Plan.

This plan does present information on sampling design, background and local background sampling locations, statistical treatment of data and reporting, sampling equipment and procedures, and quality assurance/quality control procedures.

2.0 SAMPLING DESIGN

The sampling design and strategy presented in this section are based on EPA guidance manuals and technical documents (USEPA, 1987).

2.1 Objectives

The objectives of this sampling and analysis plan are to:

- Determine whether cleaning of tanks surfaces should be continued
- Confirm that tank T-40 surfaces are clean;
- Determine whether soils surrounding the tanks are contaminated as a result of the tanks;

- Determine whether soil excavation should continue;
- Determine whether tank walls and soils removed for disposal are hazardous or nonhazardous; and
- Determine whether ground water underlying the tanks is contaminated.

2.2 Analytical Plan

This plan was developed to determine the presence of hazardous contaminants known or suspected to have been placed in the tanks. Information from the waste characterization program will be used to augment the existing information.. These constituents represent a potential threat to human health or the environment. Analytical parameters, methods, and specific analytical and sampling procedures are based on knowledge of the operations and the contents of the tanks.

A list of potential contaminants is provided in Table 1. This list identifies known potential contaminants associated with the tanks and is based on review of existing documents and discussions with plant personnel. Constituents other than those listed in Table 1, particularly if they are found in soils beneath the facility, will be regarded as originating from other operations at Rocky Flats. The list identifies methods of analysis. Detection limits will be those specified by each method.

2.3 Sampling Steps in the Closure Process

Samples will be taken during closure for two main purposes. The first purpose for sampling is to confirm the cleaning of the tank surfaces and determine the contamination levels in nearby soils and ground water. These samples will be evaluated against background or local background levels as described in Section 4.3 of the Closure Plan and Section 3.0 of this Plan.

To avoid unnecessary and time-consuming laboratory analysis of tank and environmental samples during closure activities, a "short list" of indicator parameters will be selected from the list of chemical hazardous constituents presented on Table 1. The short list will be used during the closure process for all the tanks to decide whether to continue cleaning the tank surfaces or to proceed to

TABLE 1
HAZARDOUS CONTAMINANTS
(LONG LIST)

EPA Hazardous Waste Number	Hazardous Characteristic	Possible Contaminants	EPA Method Number[1]
D001	Ignitable	--	1010, 1020
D002	Corrosive	--	1110
D003	Reactive	--	Section 8.3, 7.3
D004	Toxic	Arsenic	7060, 7061
D005	Toxic	Barium	7080, 7081
D006	Toxic	Cadmium	7090, 7091
D007	Toxic	Chromium	7190, 7191, 7195, 7196, 7197
D008	Toxic	Lead	7420, 7421
D009	Toxic	Mercury	7470, 7471
D010	Toxic	Selenium	7740, 7741
D011	Toxic	Silver	7760, 7761
F001	Toxic	Tetrachloroethylene	8010, 8240
		Trichloroethylene	8010, 8240
		Methylene chloride	8010, 8240
		1,1,1-Trichloroethane	8010, 8240
		Carbon tetrachloride	8010, 8240
		Chlorofluorocarbons	8010, 8240
F002	Toxic	Tetrachloroethylene	8010, 8240
		Trichloroethylene	8010, 8240
		Methylene chloride	8010, 8240
		1,1,1-Trichloroethane	8010, 8240
		Chlorobenzene	8120, 8240

[1] From EPA SW-846 2nd edition. A choice of methods is presented.

Source: RCRA Part A Permit Application, U.S. Department of Energy, May 6, 1988 and personal communications, as detailed in the Closure Plan, Section 2.0.

TABLE 1--Continued

HAZARDOUS CONTAMINANTS

(LONG LIST)

EPA Hazardous Waste Number	Hazardous Characteristic	Possible Contaminants	EPA Method Number
		1,1,2-Trichloro-1,2,2-trifluoroethane	8010, 8120,

the next step in the closure process. For the 60-series tanks, the short list will be used to determine whether soil must continue to be excavated. A possible short list is presented in Table 2.

The second purpose for sampling is to determine whether or not material to be disposed of is hazardous waste as defined by RCRA. These samples will be evaluated against the RCRA definition of hazardous waste.

2.3.1 T-40

Sampling activities occur at many decision points in the closure process. Sampling activities for T-40 are presented in Figure 4.2. These sampling activities will occur in the following order and will sample the following materials:

- rinsate sampling of wash water that follows steam cleaning for short list analyses to determine whether further cleaning should be done; and
- concrete chip-sampling of all tank surfaces for short list analyses.

If the chip samples show that the tank remains contaminated, then no concrete core samples or soil samples need to be taken because the tank cannot be clean-closed. The tank will then be closed as a landfill. If the chip samples show that the tank has been cleaned of all hazardous constituents, further sampling will take place to pursue the clean closure option. The additional sampling will consist of the following:

- Concrete core sampling at representative, visually-identifiable cracks, and other locations, and soil sampling beneath the concrete sampling locations, for the long list analyses; and
- Ground water sampling at monitor wells for long list analyses.

2.3.2 T-66, T-67 and T-68

Sampling activities occur at many decision points in the closure process for the 60-series tanks, as shown in Figure 4.3. These sampling activities will occur in the following order and will sample the following materials:

- Rinsate sampling of wash water following spray and circulation of cleaning solution for short list analyses to determine whether further cleaning should be done;

TABLE 2

EXAMPLE INDICATOR HAZARDOUS CONTAMINANTS

(SHORT LIST)

EPA Hazardous Waste Number	Hazardous Characteristic	Possible Contaminants	EPA Method Number[1]
T-40			
D007	Toxic	Chromium	7190, 7191, 7195, 7196, 7197
D011	Toxic	Silver	7760, 7761
F001	Toxic	1,1,1-Trichloroethane	8010, 8240
T-66, T-67, T-68			
D007	Toxic	Chromium	7190, 7191, 7195, 7196, 7197
F001	Toxic	1,1,1-Trichloroethane	8010, 8240

Radionuclides	Possible Contaminants	EPA Method Number[1]
All tanks		
gross alpha and beta	American, Plutonium	9310

- Concrete chip sampling following tank demolition, for long list analyses to determine appropriate disposal classification; and
- Soil sampling following tank demolition and removal, for short list analyses to determine whether additional soil should be removed.

Soil analyses for short list analyses will be continued in approximately six inch increments until the soil is found to be clean or until five feet of soil has been removed. If soil is found to be clean using the short list, the long list analyses will be performed. If the soil is clean, no ground water sampling will be required because clean closure can be achieved. If the soil is still contaminated at the five foot level, ground water sampling will be required.

3.0 BACKGROUND SAMPLING LOCATIONS

In order to evaluate potential contamination derived from T-40, T-66, T-67, and T-68, it is necessary to compare the sample results to those of an appropriate reference or background sample. Four different types of background samples will be used as follows:

- Clean rinsate from the final rinse of the tanks;
- Chipped concrete;
- Soils; and
- Upgradient ground water.

The water used to rinse the tanks after they are cleaned will be sampled before it enters the tanks for comparison with the used rinsate.

Five samples of concrete will be taken from the outside of T-40 at a location above the soil level and away from any manholes or other potential spill locations. No concrete background samples are required for the other tanks. The background samples will be scarified and decontaminated by triple rinsing prior to sampling by chipping. Paint will be removed from the samples before analysis.

Soil samples were collected from the West Buffer zone of the Rocky Flats Plant to support activities at the Solar Evaporation Ponds (Rockwell, 1988a). As previously mentioned, additional soil samples will be collected from this area to improve the statistical validity of the data so that the West Buffer zone samples can be used as the Plant background soil samples.

Local background soil samples will be taken at four locations in the vicinity of Building 774 from areas that have a low probability of contamination. The local background soil samples will be compared to the Plant background soil samples along with the samples from underneath and adjacent to the tanks in order to assess the extent of general contamination in the tank vicinity. A core will be collected from 12 to 36 inches deep and individually composited for each of the following levels:

- 12 to 24 inches
- 24 to 36 inches.

Local background ground water samples will be taken from a well that is determined to be upgradient of the tanks. It is unclear from the information presently available what the direction of ground water flow is under Building 774, and this must be determined before an upgradient well can be identified. Three wells in the vicinity of Building 774 are potential candidates but it is conceivable that a new well will have to be installed.

4.0 SAMPLING LOCATIONS

Sampling locations for T-40, T-66, T-67 and T-68 can be classified into four main categories:

- Inside surfaces of tanks, including rinsate, wipe, and concrete chipping;
- Inlet and outlet tank piping;
- Cores of the tank wall and soils around the tanks; and
- Ground water upgradient and downgradient of the tanks.

The interior surfaces of the tanks, namely the walls, bottom and top, will be sampled based on sample points along a diagonal on each surface. Sample points will be equidistant over the length of the diagonal giving step-wise changes in two axes.

Diagonals will start in the bottom left and end in the top right corner of each wall. Concrete chip samples will always be taken in the corners with the remaining sample points spaced approximately equal distances along the diagonal. Sample points will be moved to points of potentially greater contamination if surface

characteristics, such as discoloration, are observed. Diagonals for tank top and bottom will also include corner samples. The remainder of chip samples for the top and bottom surfaces will be spaced similarly to the wall samples.

Piping subject to closure will be evaluated based on the analysis of rinsate flowing through them. The pipe chase will be visually inspected for signs of spillage or leakage by removing the top panels. If contamination on the concrete surfaces is evident, the pipe chase will be cleaned using the chemical washes, rinses and steam cleaning steps utilized within the tanks. If no contamination is found or cleaning has occurred, concrete chip samples will be taken.

Cracks in any of the tank or pipe chase surfaces will be further investigated by coring through the concrete and sampling the soils beneath the cracked area. Soil samples will be collected in four segments: 0 to 6 inches, 6 to 12 inches, 12 to 24 inches, and 24 to 36 inches.

Ground water will be sampled upgradient and downgradient of the tanks. As discussed in Section 3.0, Existing Environmental Conditions, more information is needed to determine if any existing wells are adequate for characterization. Additional wells will be installed, if necessary.

The diagonal grid sample systems for each tank and the pipe chase are discussed below.

4.1 T-40

Each large wall in T-40 will have a minimum of five concrete chip samples. The remaining two walls and the tank bottom and top will each have four samples. The top will have the same number of samples as the bottom due to the potential for contact by the tank contents.

4.2 T-66, T-67, and T-68

Concrete sampling will be performed after tank demolition to determine the appropriate disposal site. Five representative concrete fragments will be taken from debris of T-66 and T-67. Five additional samples will be taken from the debris of T-68.

4.3 Pipe Chase

A total of five concrete chip samples will be taken within the pipe chase. Three samples will be taken from the floor and one each from the largest walls.

5.0 ANALYTICAL PROCEDURES, DATA QUALITY, AND STATISTICAL TREATMENT OF DATA

Analyses will be performed by the laboratory in accordance with EPA Report SW-846. To ensure quality data, all of the sampling procedures to be employed will be conducted in conformance with EPA guidelines. All analytical methods will be in compliance with minimum quality control criteria of standard EPA methods, where such criteria exist. The analytical laboratory will submit all analytical and QA/QC procedures to Rockwell International for review and approval prior to the analysis of samples. The EPA guidelines for reporting accuracy, precision, and practical quantification limit of analytical methods will be met.

Duplicate samples will be taken for concrete chips, soils, and ground water. One duplicate of each of these media will be selected and analyzed during each phase of the sampling. The duplicates will be used as an indication of the homogeneity of the medium.

All data will be analyzed and tabulated for evaluation using the methods described in SW-846 and other guidance documents and statistical tests where applicable. Actual values received from the laboratory will be presented in an appendix for independent review. Quality control data received from the laboratory will be used to evaluate the probability of false positives or false negatives. Data for individual hazardous constituents will be summarized and will include the following information:

- Number of "less than" (LT) detection limit values
- Total number of values
- Mean
- Standard deviation
- Coefficient of variation

- Minimum value
- Maximum value

The use of log-normal distributions for naturally-occurring metals will be used for calculating the mean and standard deviation, and to compare the detected values to background data. For other hazardous constituents, normal distribution will be used in these calculations. The test of homogeneity of variance will be performed to determine the proper version of the t-test to be used in comparison with background values.

6.0 MODIFICATIONS TO SAMPLING PLAN

Under field conditions, the optimal aspects of preliminary sample design are sometimes not achievable. Factors adversely influencing sampling efforts can include equipment malfunction or breakdown, improper equipment, physical barriers to coring equipment, weather conditions, soil conditions, and overly optimistic evaluation of other physical conditions at sites with no previous history of hazardous waste characterization. Because of unforeseen field conditions, modifications to the planned activity may be necessary. When conditions are encountered that require modifications in the field, the field team leader or cognizant engineer will first obtain the approval of the project technical leader and/or the cognizant environmental quality assurance/quality control authority and then take the following steps:

- Document the modifications required by recording this information in the field logbook, including the modifications made and a justification for the change; and
- Obtain the project team leader's (cognizant engineer) approval and field logbook signature following completion of the day's field work for instances where major deviations from the sampling plan occur.

These procedures will provide an accurate record of modifications and allow sampling to proceed safely, while maintaining efficient use of equipment and staff.

7.0 REPORTING

After completion of the sampling effort, verification documents will be provided for actual sample locations, numbers of samples, and specific methods used for collection. Data received from the laboratory will be reviewed, analyzed, and summarized statistically. The results will be used to provide an evaluation of whether contaminants exceed background levels. The process outlined in the decision tree diagram will be followed and the results will be discussed.

8.0 SAMPLING EQUIPMENT AND PROCEDURES

8.1 Sampling Equipment

Sampling equipment to be used will be appropriate to the spectrum of media that may be encountered. The media to be sampled potentially consist of:

- Rinsate;
- Concrete surfaces;
- Soils (beneath the concrete); and
- Ground water.

The following are examples of the types of sampling equipment that may be used during the various phases of the investigation:

- Concrete Surfaces
  - chisel
  - hammer/sledgehammer
  - concrete coring device
- Soils
  - auger
  - split spoon
  - trowel
  - scoop
  - shovel
- Ground Water
  - teflon well bailer
  - nylon rope
  - stainless steel submersible pump
  - water level indicator

An auger and split spoon will be used if site conditions permit. Otherwise, a trowel, scoop, or shovel will be used to collect soil samples. If soil sampling is conducted, the sampling equipment should be constructed of stainless steel or have liners constructed of inert materials. All sampling equipment will be decontaminated prior to use and after each use to prevent cross-contamination.

Additional equipment and supplies will be procured as required to perform the necessary sampling. Equipment may include, but not be limited to, the following.

- Chain-of-custody forms.
- Field notebook.
- Water level data forms.
- Wire brushes.
- Stainless-steel mixing bowls.
- Sized, heavy-duty plastic bags.
- Polaroid camera.
- Stainless steel spatulas, scoops, and spoons.
- Adhesive tape.
- 100-foot/30-meter steel tape, 12-feet/3-meter steel tape.
- Compass.
- Indelible marking pens or pencils.
- Ice chests and ice.
- Security tape, flagging.
- Plastic and leather gloves.
- Field radio.
- Rags.
- Flagging.
- Appropriate drawings and maps.
- Labels, seals.
- Large plastic sheeting.
- Water containers.
- Extra glass and plastic bottles (in case of breakage or contamination).
- Industrial-size shop vacuum.

- Teflon sheets.
- Bentonite.

8.2 Sampling Procedures

8.2.1 Rinsate

Upon completion of tank internal surface cleaning using spray and circulation or steam/vacuum, the surfaces will be rinsed with water. This rinsate will be sampled to evaluate the decontamination procedures which have been done. Samples will be taken after rinsate has been recycled through the tank, and inlet and outlet piping for at least 15 minutes to ensure complete mixing.

Sample containers will be submerged in the rinsate and allowed to fill in such a manner that ensures all air bubbles adhering to the container sides are freed. Samples for volatile organics analysis will be collected in 40 milliliter septum vials making sure the Teflon liner faces inward after capping. The bottle will be inverted and checked for air bubbles.

8.2.2 Concrete Surfaces

Concrete surface samples will be collected along the diagonal grid systems for each tank as discussed above. When suspected areas of contamination are identified through visual observations sample points will be moved to accommodate these.

Concrete chip samples will be collected using a tempered, pre-cleaned stainless steel chisel and appropriately weighted sledge hammer. Chips will be taken from a sample area at least 2 square inches and 0.25 inches deep. Chips will be collected in appropriate containers to analyze for metals and organics. The chisel will be cleaned in dilute (1:100) nitric acid solution and triple rinsed with distilled water before each new sample is taken. Rinsate will be containerized in a new 17-E closed head 55-gallon drum for disposal on site in the current aqueous waste treatment process.

8.2.3 Concrete Cores (T-40)

In order to obtain soil samples from areas suspected of contamination it will be necessary to remove a concrete core to expose the soil. These suspected

contamination areas would be expected to be on or near identified cracks or areas of discoloration. A concrete coring device will cut the core, estimated to be 10 inches thick, from the center of each selected section. The coring device employs a 6-inch outer-diameter (OD) cylindrical saw that uses water as a cutting lubricant. No organic-based lubricant will be used. An industrial-size shop vacuum will be used to remove excess water from around the core. This will be done to minimize surface contamination flowing into the underlying soil. The wastewater from within the shop vacuum will be emptied into a new 17-E closed-head 55-gallon drum. The shop vacuum will be triple rinsed with distilled water, and this rinsate will be containerized with the wastewater.

Once the core is cut, it will be carefully withdrawn by hand and placed in a new 17-E closed-head 55-gallon drum used only for solid wastes generated during the closure activities.

8.2.4 Soils

The soils beneath the concrete cores (T-40) and beneath the tank locations (T-66, T-67, T-68) will be sampled to delineate the areal and vertical extent of near-surface soil contamination. At each soil sampling location, a soil sample of the first 6 inches will be collected using a clean, stainless-steel, hand operated 4 inch OD soil auger. For T-66, T-67 and T-68, dust and debris from tank demolition will be removed from the soil surface prior to soil sampling. For these tanks, soil samples will be collected in the first 6 inches of the exposed surfaces. For T-40, samples will be collected from the 6 to 12 inches, 12 to 24 inches, and 24 to 36 inches if the tank can be adequately cleaned. Samples from the hole will be collected with a liner to minimize loss of volatiles. Once sampling is complete, the soil auger will be decontaminated by triple rinsing.

Excess soil that is removed from each hole will be containerized in a preconditioned 17-H open-headed 55-gallon container pending results of the soil analyses. The container will be stored at Building 774 until a decision on proper disposal can be made, based on the results of the soil analyses.

For T-40, each core hole will be filled with bentonite clay pellets after sampling is completed. Enough water will be added to the pellets to cause them to swell and seal the hole from water infiltration.

8.2.5 Ground Water

Ground water will be sampled if soils are contaminated beneath the tanks. Upgradient wells will be purged and sampled first to guard against contamination from downgradient wells. Normally, three to five volumes of water are purged from the well but exceptions are made for wells with low recharge rates. Temperature, pH, and conductivity will be monitored during the purge cycle to ensure that both have stabilized before the sample is taken. The samples will be taken with a Teflon bailer and dedicated braided nylon cord. All purging and sampling equipment will be decontaminated prior to each use.

8.2.6 Sample Containers and Preservation

Sample containers will be chosen based on their compatibility with the samples, resistance to leaking or breakage, ability to seal tightly, and required volume for an optimum sample. Containers for collecting and sorting samples will be made of high-density plastic or glass appropriate for the constituents to be analyzed. The containers will have tight, screw-type lids with Teflon® cap liners for glass bottles. Filter papers used in wipe sampling, will be placed in a 40-ml, glass, screw-cap, volatile organics analysis (VOA) vial with a Teflon®-faced silicone septum. The supplier of containers will have precleaned them according to EPA protocols.

Once the samples have been collected, preservation may be required to protect the chemical and physical integrity of the samples. All samples collected will be preserved in accordance with the applicable EPA procedures and will be shipped within 48 hours of collection to the analytical laboratory.

Regardless of the type of sample, all samples will be placed in an ice chest and cooled to 4°C as soon as possible after collection. Because the samples will be collected from radiation zones, they must be checked by a radiation protection technologist prior to removal from the site according to Rockwell International standard operating procedures. This will be done in a manner that will not compromise validity of the sample.

9.0 SAMPLING QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance (QA) for the project will be established, based on DOE procedures, to ensure that high-quality data are generated from the sampling

activity. All procedures established under a project Quality Assurance/Quality Control (QA/QC) plan will be followed. There are three basic elements to the QA strategy: accountability, controllability, and traceability.

Accountability will be achieved through a detailed sampling and analysis plan.

Controllability will be accomplished through the use of trip blanks. One trip blank will be submitted per day.

Traceability involves the documentation necessary to reconstruct the completed sampling program through an independent review of project records. Sampling records to be kept on file include field notes, daily memoranda, records of meetings and activities concerning the sampling program, and chain-of-custody records.

Quality control will be implemented through the recording of field memoranda and field notes. The types of records and documentation required to provide traceability for all samples are described in the following paragraphs.

9.1 Field Log Book

The personnel conducting sampling will maintain an official log book during the effort. The book will be bound and have consecutively numbered pages. All information pertinent to the sampling must be recorded in the log book in a legible fashion. If changes are necessary, they will be indicated by a single line drawn through the affected text. The individual responsible for the change will initial and date the entry. Each day's activities or separate sampling episodes must be signed. The log book should be protected, stored in a safe file or other repository, and kept as a permanent record.

The following are types of information that should be included:

- Site map, sketch, drawing, or other definitive site description;
- Locations of all sampling points, including reference permits and scale;
- Sample method;
- Date and time of collection;
- Collector's name;
- Number, type, volume of samples taken;

- Identification number for each sample;
- Field observations (weather conditions, temperature, wind, wetness and appearance of sample, etc.);
- Laboratory of destination;
- Field measurements (if any); and
- Signature of recording personnel.

Additional items that may be included are:

- Name and address of field contact;
- Producer of waste;
- Type of process;
- Type of waste;
- Type/purpose of sampling;
- Sample transportation method;
- Photographs of site for field conditions and site location verification; and
- Other pertinent information.

9.2 Sample Labels

Labels should be securely attached to each sample to prevent misidentification. They may be stick-on labels or tags and should be affixed to the proper sample containers prior to, or at the time of collection. All information should be filled out at the time of collection. Indelible pencil or ink should be used. Each label should contain at least the following information:

- Site contractor;
- Collector's name;
- Date and time collected; and
- Sample number.

9.3 Sample Seals

Sample seals should be used to prevent and/or detect tampering with samples between the time of collection and the beginning of analysis. Seals should be applied to the sample containers prior to their leaving the sample location. The seals must be attached so that the seal must be broken to open the container.

9.4 Chain-of-Custody Record

To ensure the integrity of the samples from collection through analyses to final disposition, documentation is necessary to trace sample possession and handling. This documentation generally takes the form of a record providing a history of all people having custody of the sample, including situations where the sample is:

- In a person's physical possession;
- In view of a person;
- Secured by individual so tampering is impossible; and
- Placed in an area restricted to authorized personnel only.

A chain-of-custody record should be filled out and should accompany all samples from collection to analysis. Multiple copies will be required and at least one copy must be maintained by the sampling supervisor. The following information should be included:

- Contractor;
- Sample numbers;
- Date and time collected;
- Sample type;
- Number of containers;
- Collector's signature;
- Signature of person receiving possession;
- Inclusive dates of possession; and
- Condition of samples upon receipt.

9.5 Sample Analysis Request

The sample analysis request form is designed to accompany the samples to the laboratory and designate the analyses to be performed on each sample. It also provides a check to ensure that all samples have been received and that correlation between sample analysis and sample number is finalized and complete. The information that should be included on this form includes the following:

- Contractor;
- Company contact;
- Collector;
- Sample number;
- Sample type;
- Analysis requested;
- Data and time collected; and
- Laboratory sample custodian.

9.6 Laboratory Receipt and Logging of Sample

In the laboratory, a sample custodian should be assigned to receive the samples. Upon receipt of a sample, the custodian should inspect the condition of the sample and the sample seal, verify the information on the sample label and seal against that on the chain-of-custody record, assign a laboratory number, log in the sample in the laboratory log book, store the sample in a secured sample storage room or cabinet, and report missing or damaged samples immediately.

9.7 Sample Disposition

After all analyses have been completed as requested, reports should be reviewed for anomalous data. Requests for re-analysis or data checks should be made as soon as possible. At the certified completion of all analyses, the samples should be returned to the collector and samples properly disposed of or archived by the laboratory, if requested. In no case shall the samples be held longer than three years, unless specifically designated.

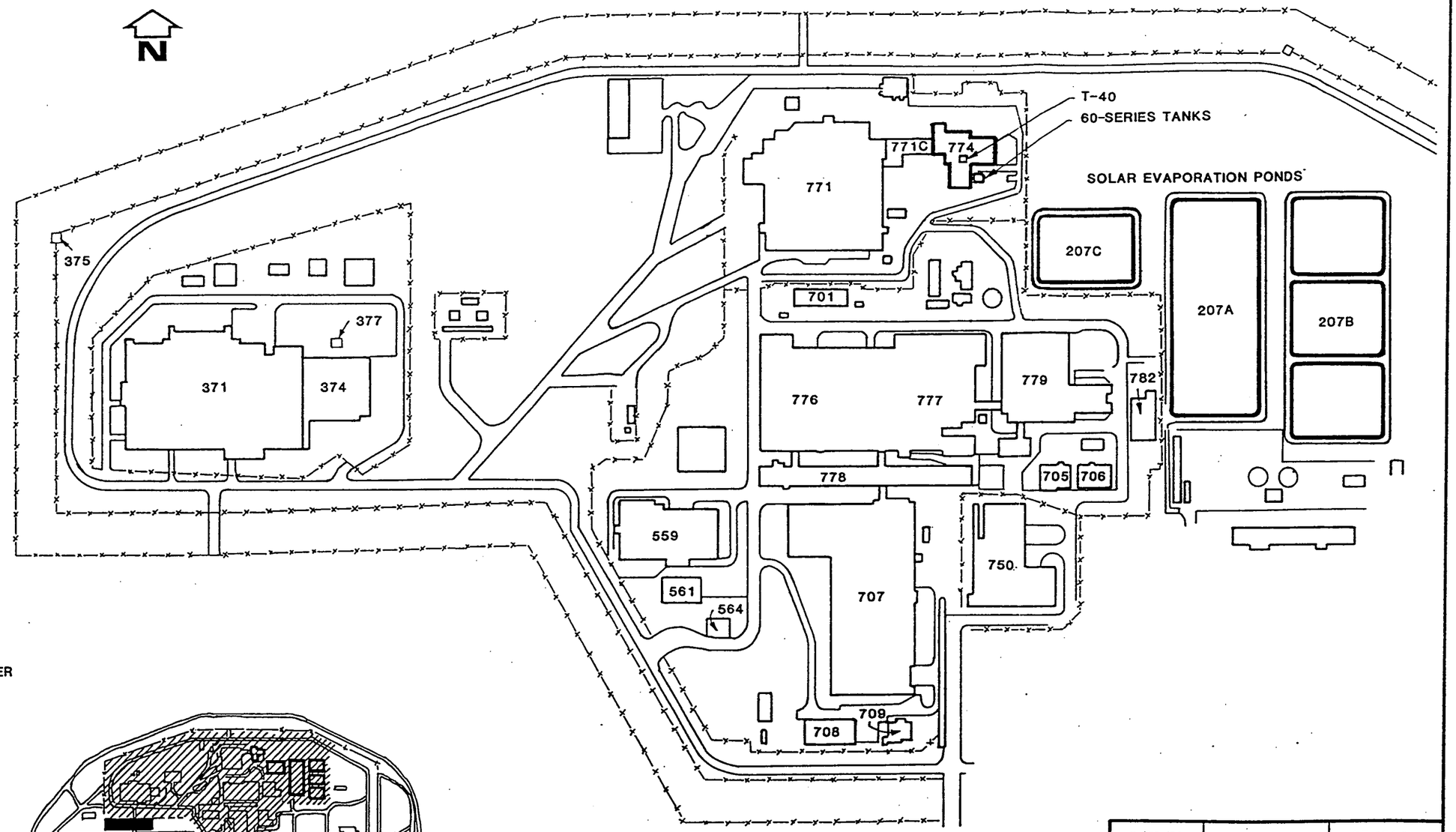
10.0 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

The contractor laboratory will ensure the integrity and validity of test results through implementation of an internal quality control program. The program will meet the QC criteria of applicable methods manuals. A system of reviewing and analyzing the results of these samples will be maintained to detect problems due to contamination, inadequate calibrations, miscalculations, improper procedures, or other causes. Standard methods will be used. Alternative methods that are developed or adapted will be tested and completely documented. All methods and method changes will be approved by a Rockwell International contracts representative.

The quality control procedures for hazardous chemical analyses will include (as appropriate to each analysis) evaluation of blanks, random matrix spikes (for 10 percent of samples), internal standards, surrogates, and standard calibration curves. Spikes will be added in amounts comparable to the amount of analyte present in the sample. Quality control procedures specific to individual methods will be detailed in the laboratory's documented analytical procedures.

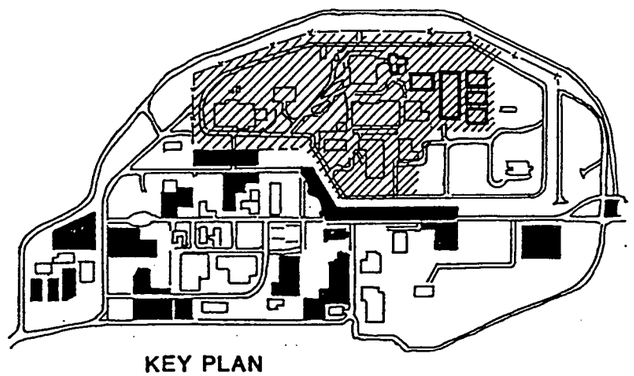
11.0 HEALTH AND SAFETY PLAN

A health and safety plan (HASP) is required for all hazardous waste sampling sites. It is intended to contain information pertinent to field assignments and to be a guide during an unusual situation or emergency. A HASP will be developed by Rockwell International approximately 2 months before initiation of closure activities and be reviewed and approved prior to initiation of sampling. The documents governing health and safety procedures at Rocky Flats will be the basis of the sampling discussion in the HASP. These documents and general safety requirements are discussed in the closure plan.



LEGEND:

774 –BUILDING OR STRUCTURE NUMBER



KEY PLAN

Source: Rockwell International Drawing Number D15501–2, Issue M.

A	ORIGINAL ISSUE	
ISSUE	DESCRIPTION	
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DRAWN	B SIKORA	8/25/89
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8/30/89		DE 154.01
DATE		JOB NUMBER

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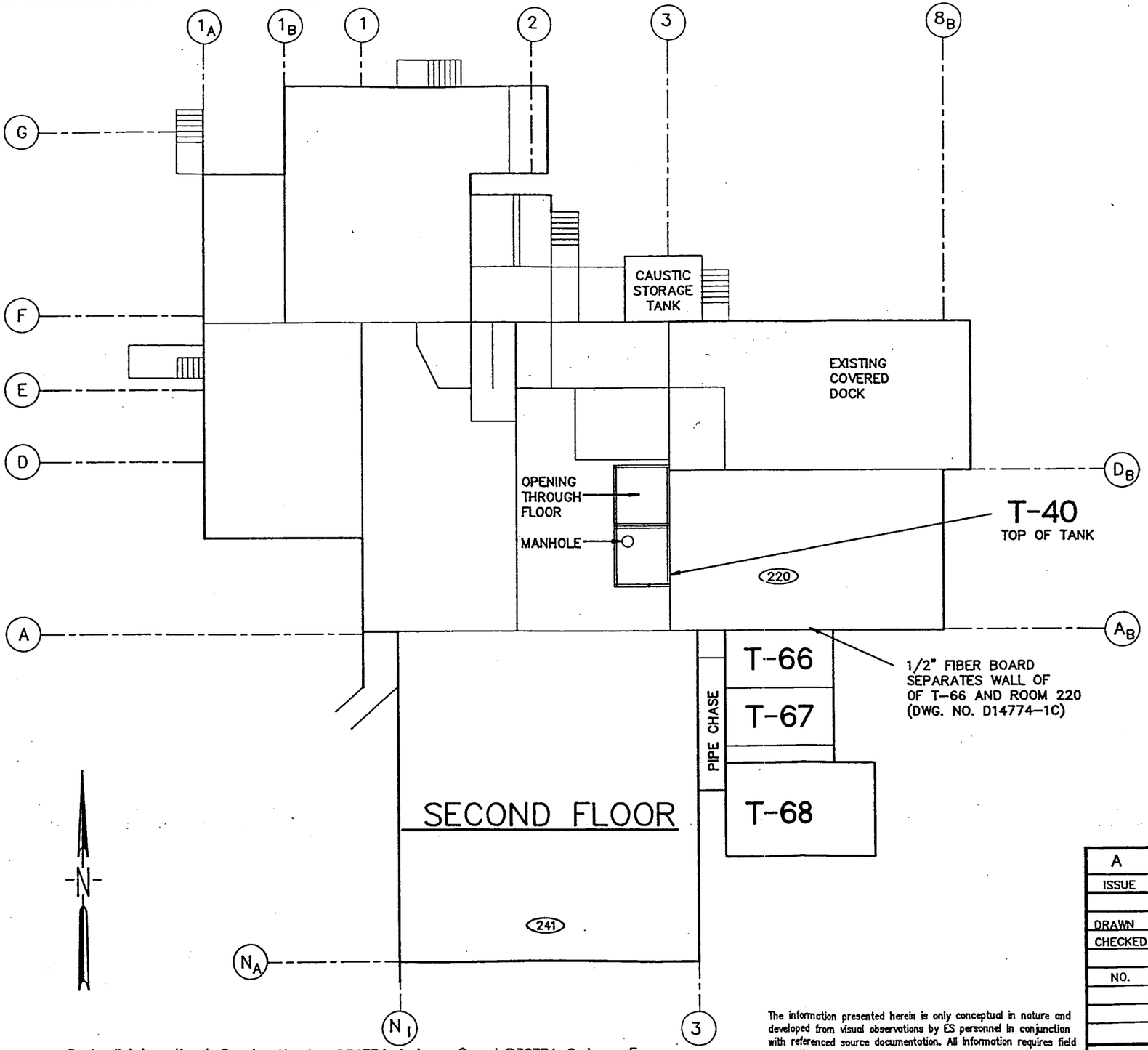
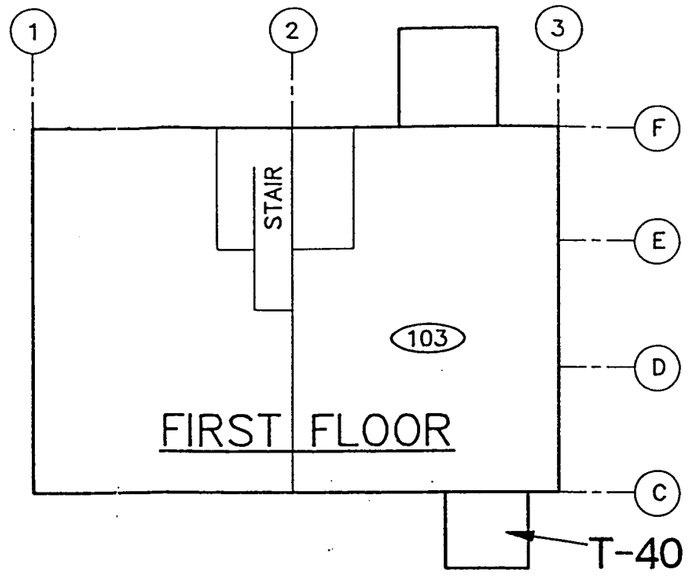
FIGURE 2.1
RCRA Closure Plan
Location of Building 774

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0





Source: Rockwell International, Drawing Number D30774-1, Issue G and D30774-2, Issue F.

The information presented herein is only conceptual in nature and developed from visual observations by ES personnel in conjunction with referenced source documentation. All information requires field verification before further usage.

15401-06

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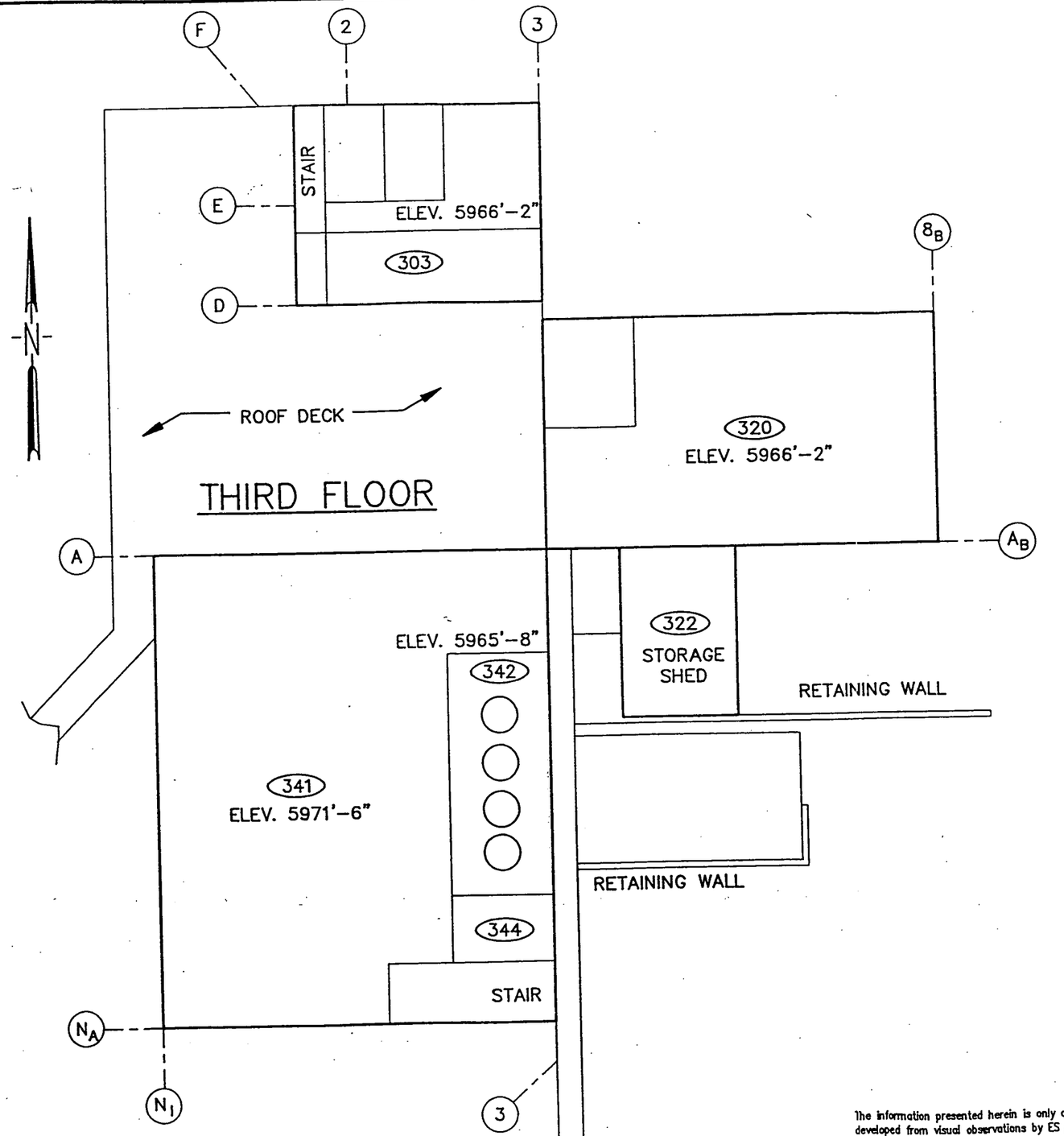
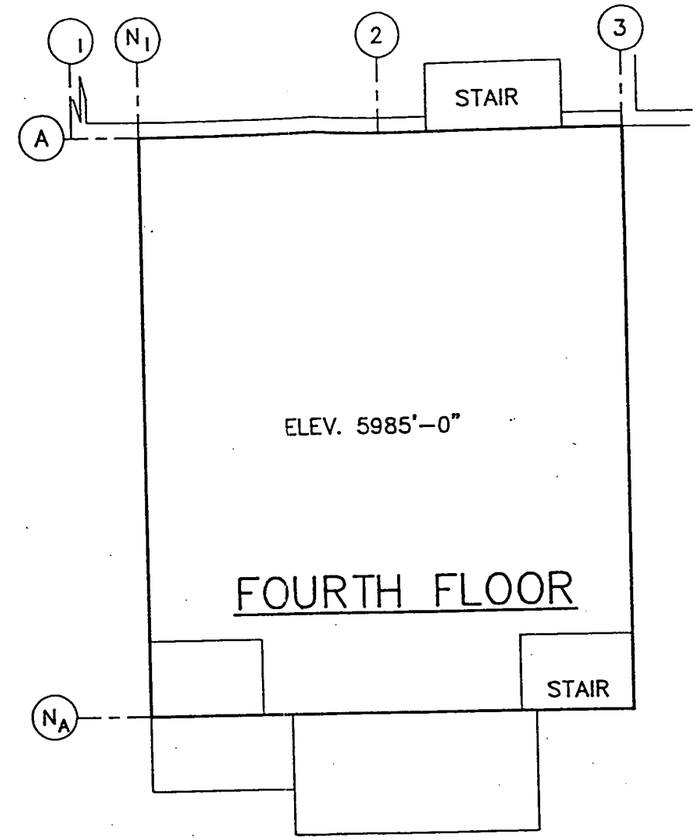
FIGURE 2.2
RCRA Closure Plan First and Second Floor Plans Building 774

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: Rockwell International, Drawing Number D30774-2, Issue F.



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15401-05

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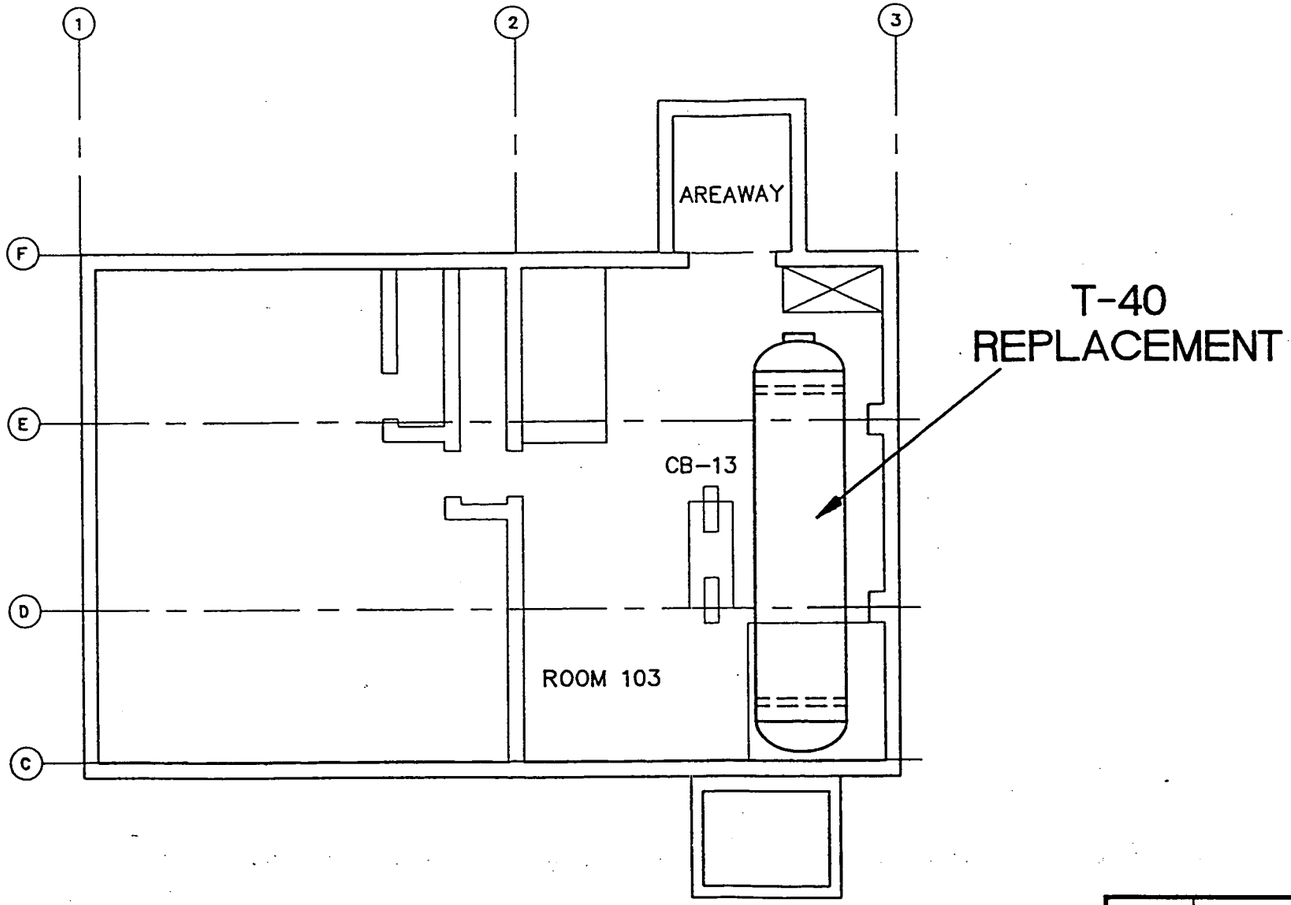
FIGURE 2.3
RCRA Closure Plan
Third and Fourth Floor Plans
Building 774

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: Rockwell International, Drawing Number D38543-200, Issue A.

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15401-07

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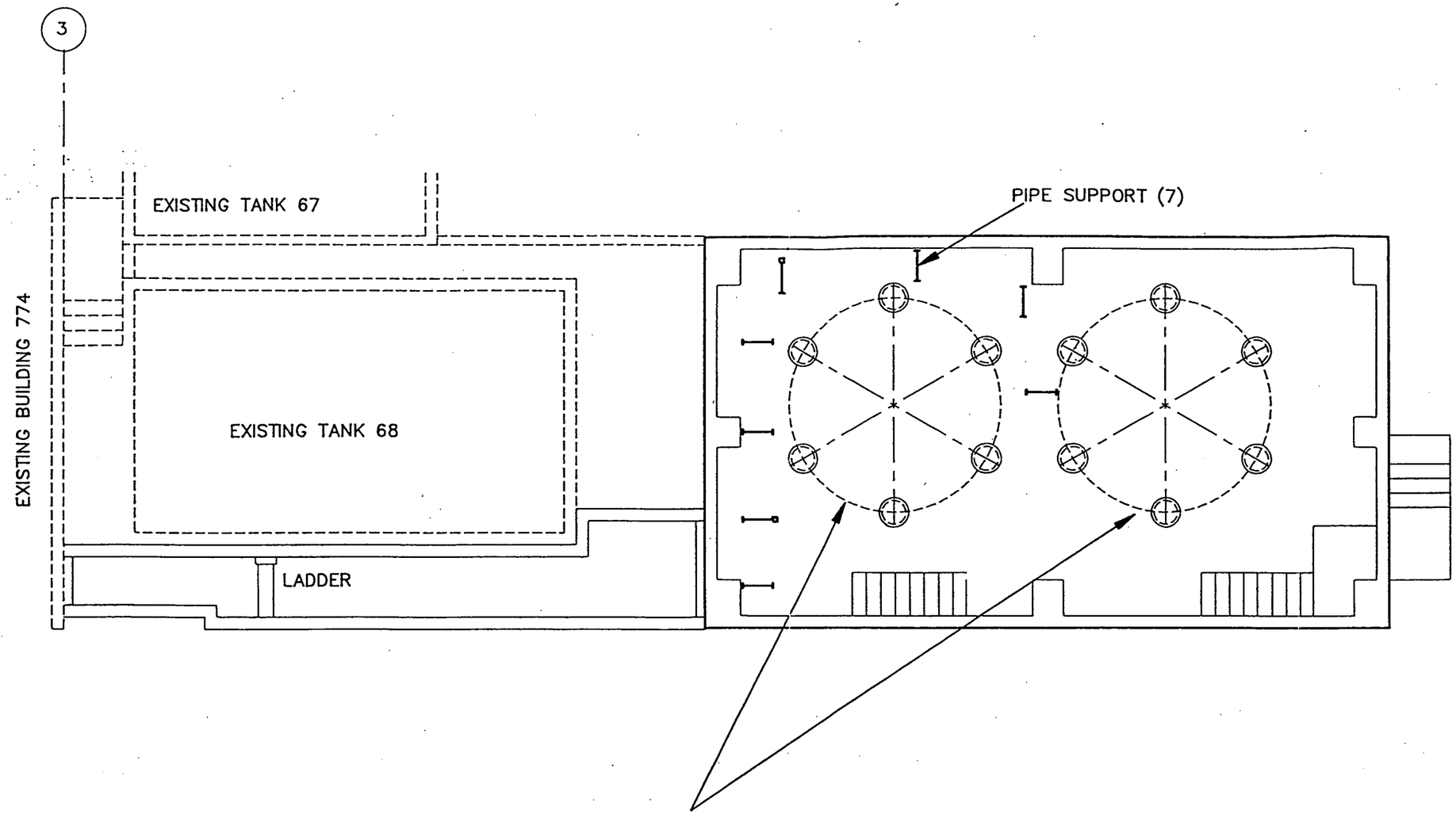
FIGURE 2.4
RCRA Closure Plan
Location of T-40 Replacement Tank Building 774

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



60-SERIES REPLACEMENT TANKS

15401-08

A	ORIGINAL ISSUE	
ISSUE	DESCRIPTION	
	BY	DATE
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FIGURE 2.5
RCRA Closure Plan
Location of 60 Series Replacement Tanks

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0

Source: Merrick, Drawing Number D38544-711, Issue A.

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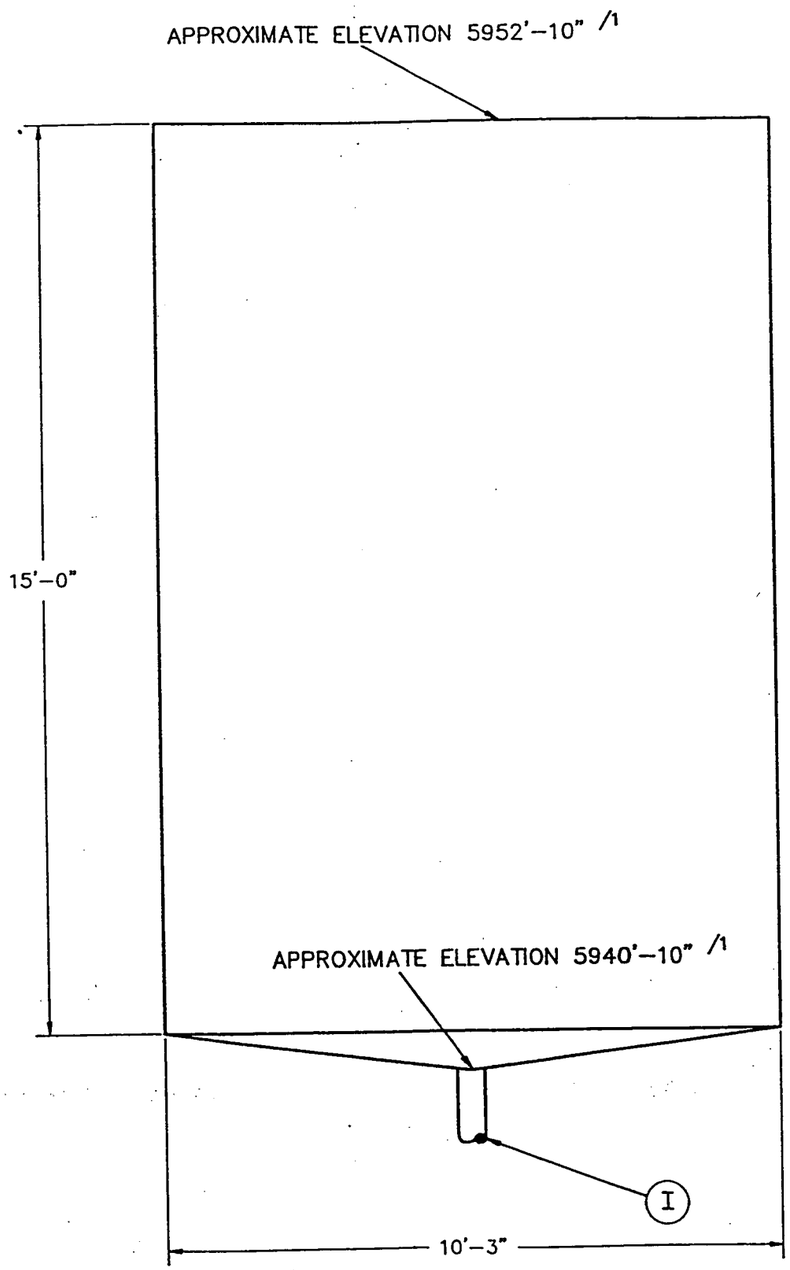
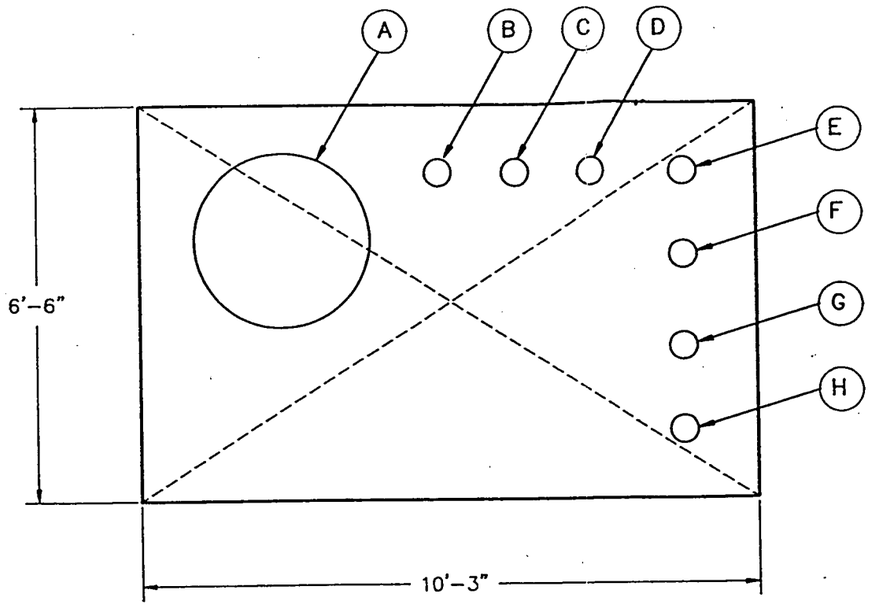


SIDE VIEW

NOZZLE SCHEDULE			
MARK	SERVICE	MARK	SERVICE
A	MANHOLE	E	VENT
B	PROCESS DECANT LINE	F	PRESSURE DIFFERENTIAL
C	PROCESS DECANT LINE	G	PROCESS WASTE LINE
D	LEVEL ALARM	H	PROCESS WASTE LINE
		I	PROCESS DRAIN



TOP VIEW

/1 ELEVATION DATA FROM DRAWING D23540–204 CONFLICTS WITH HEIGHT OF TANK NOTED IN DRAWING D37810–333.

Source: Modified from Rockwell International, Drawing Number D23540–204, Issue A, and Drawing Number D37810–333, Issue A.

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15401–09

8/30/89		DE 154.01
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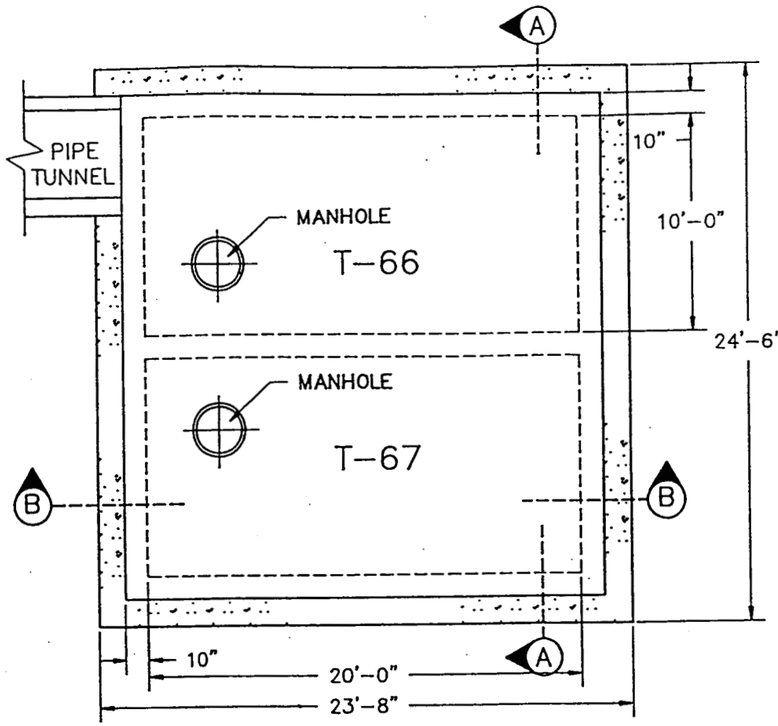
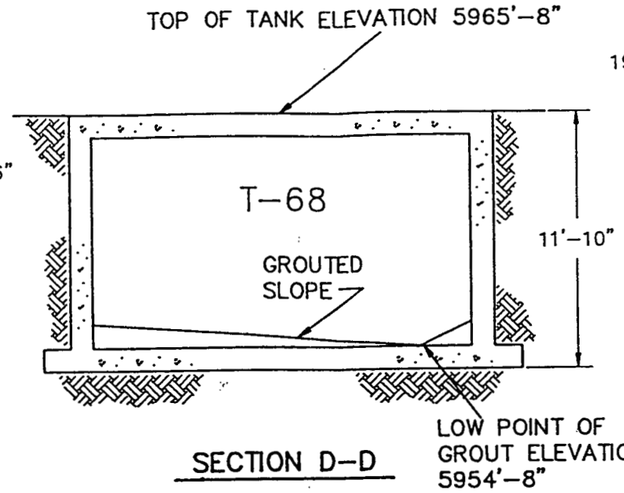
FIGURE 2.6
RCRA Closure Plan
Schematic Drawing T–40

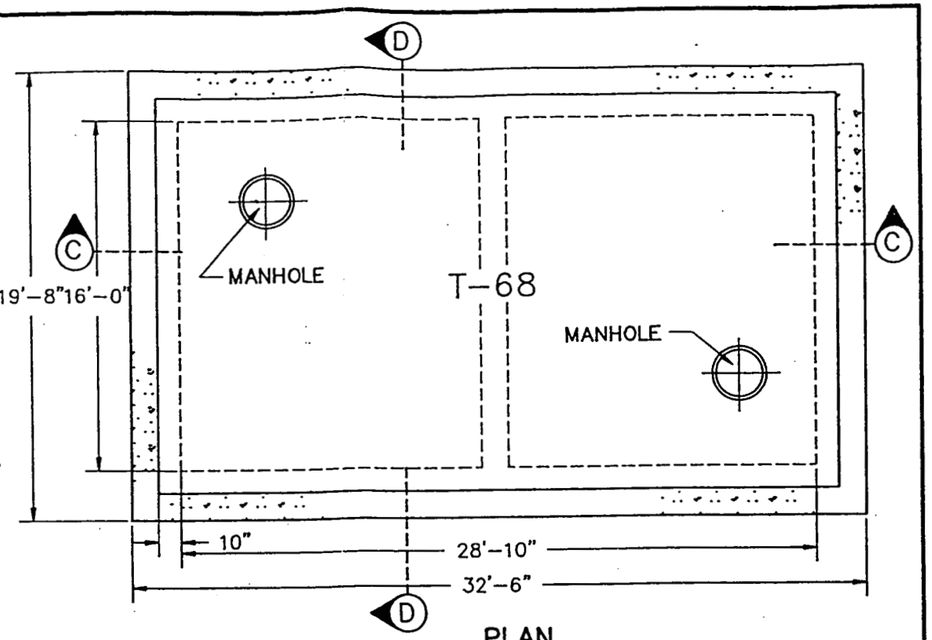
SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



PLAN



SECTION D-D



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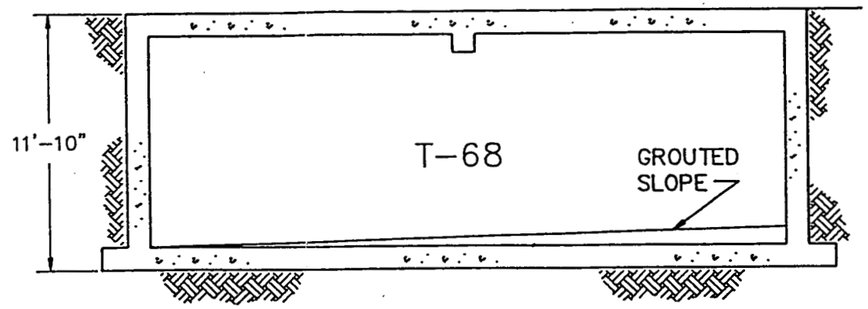
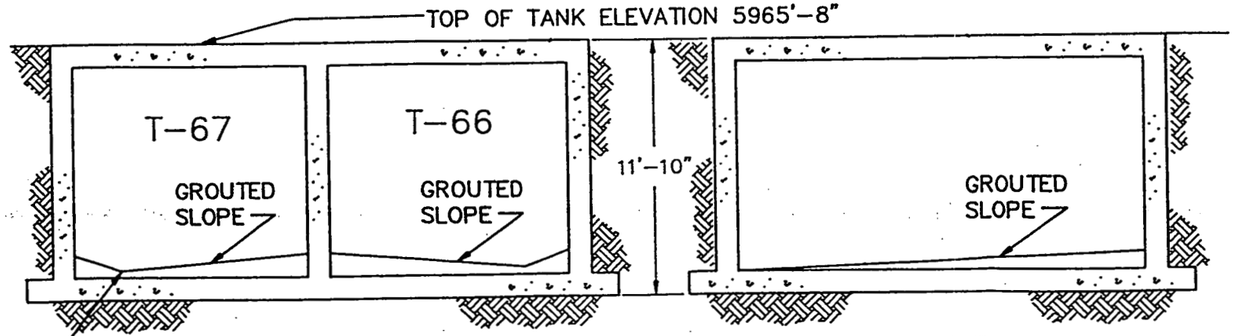


SECTION C-C



SECTION A-A

SECTION B-B

Source: Rockwell International, Drawing Number D37807-003.

The information presented herein is only conceptual in nature and developed from visual observations by ES personnel in conjunction with referenced source documentation. All information requires field verification before further usage.

15401-10

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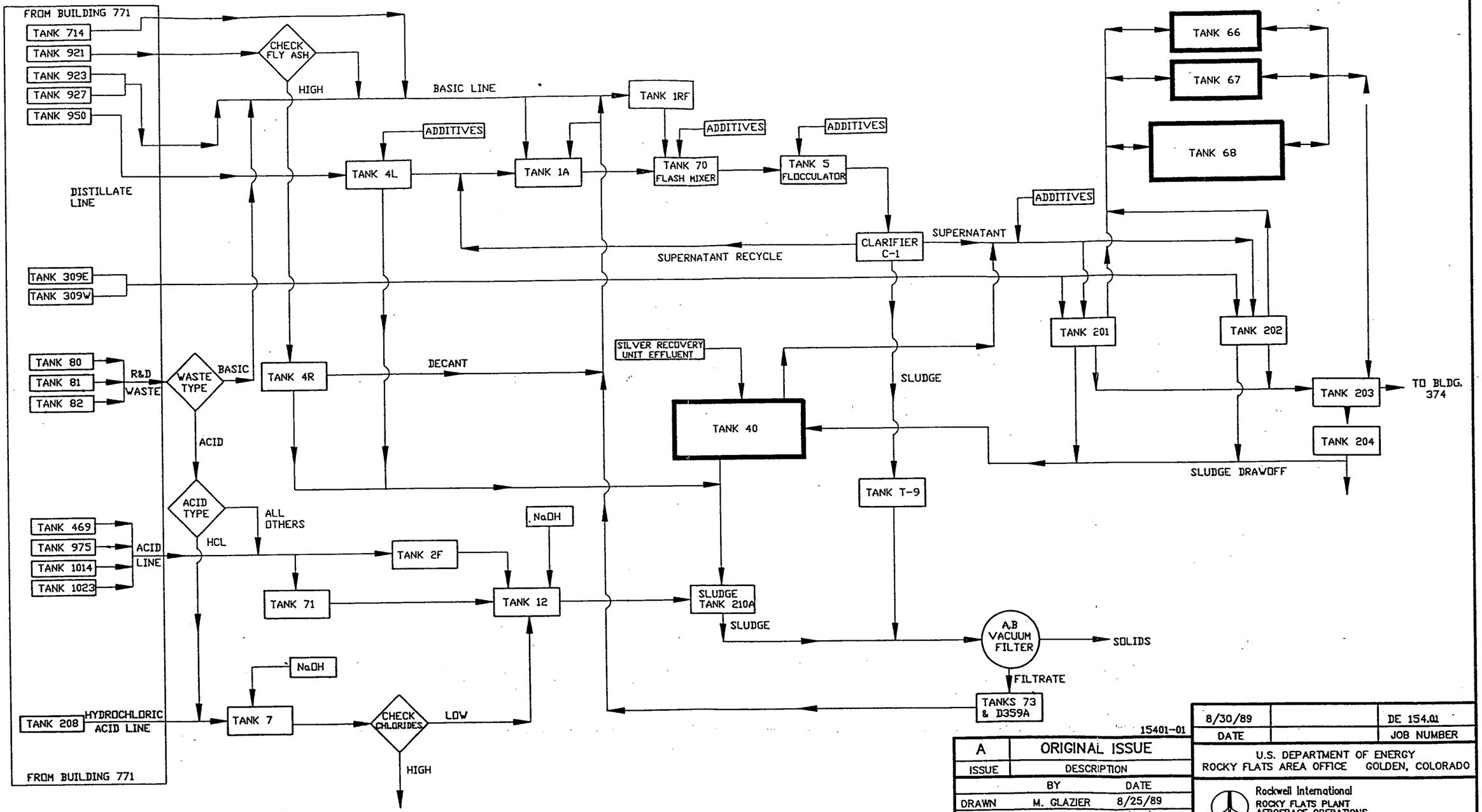
FIGURE 2.7
RCRA Closure Plan
Plans and Sections
T-66, T-67, T-68

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: U.S. Department of Energy 1988a, Issue A.

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FIGURE 2.8
RCRA Closure Plan Process Diagram

SIZE	DRAWING NUMBER	SHEET	REV
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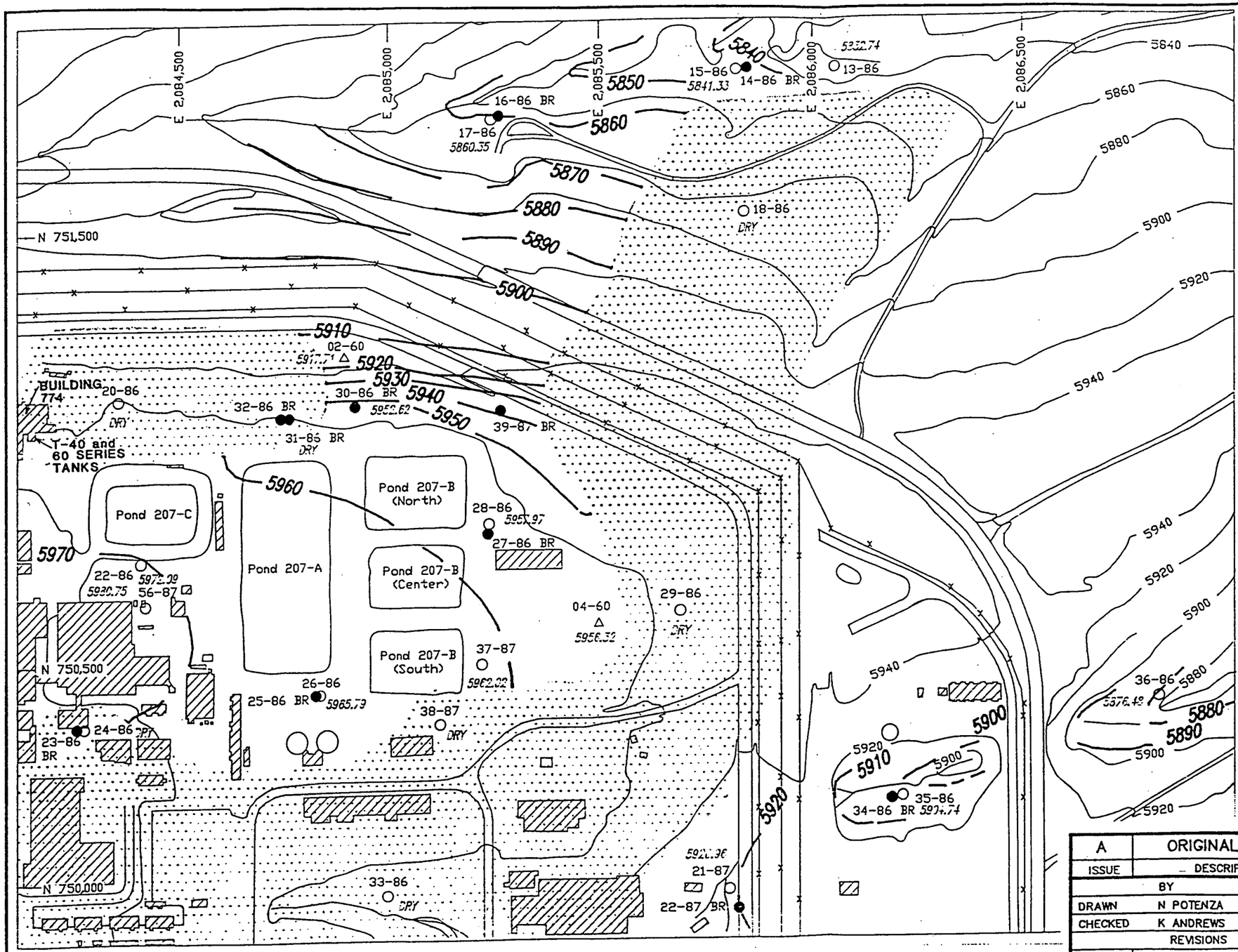

EXPLANATION

- ○ Alluvial Monitoring Well
- ● Bedrock Monitoring Well
- △ Pre-1986 Well
- 45-86 Well Designation
- 6028.62 Potentiometric Surface Elevation (feet above mean sea level)
- 6000 Line of Equal Potentiometric Surface Elevation (feet above mean sea level – dashed where approximately located)
- Approximate Area of Unsaturated Surficial Materials

NOTE: See Appendices E-1 and E-2 for Water Level Data

Source: Rockwell International, 1989b.

A	ORIGINAL ISSUE	
ISSUE	DESCRIPTION	
	BY	DATE
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REVISIONS		
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SCALE:	1 INCH = 250 FEET	

8/30/89		DE 154.01
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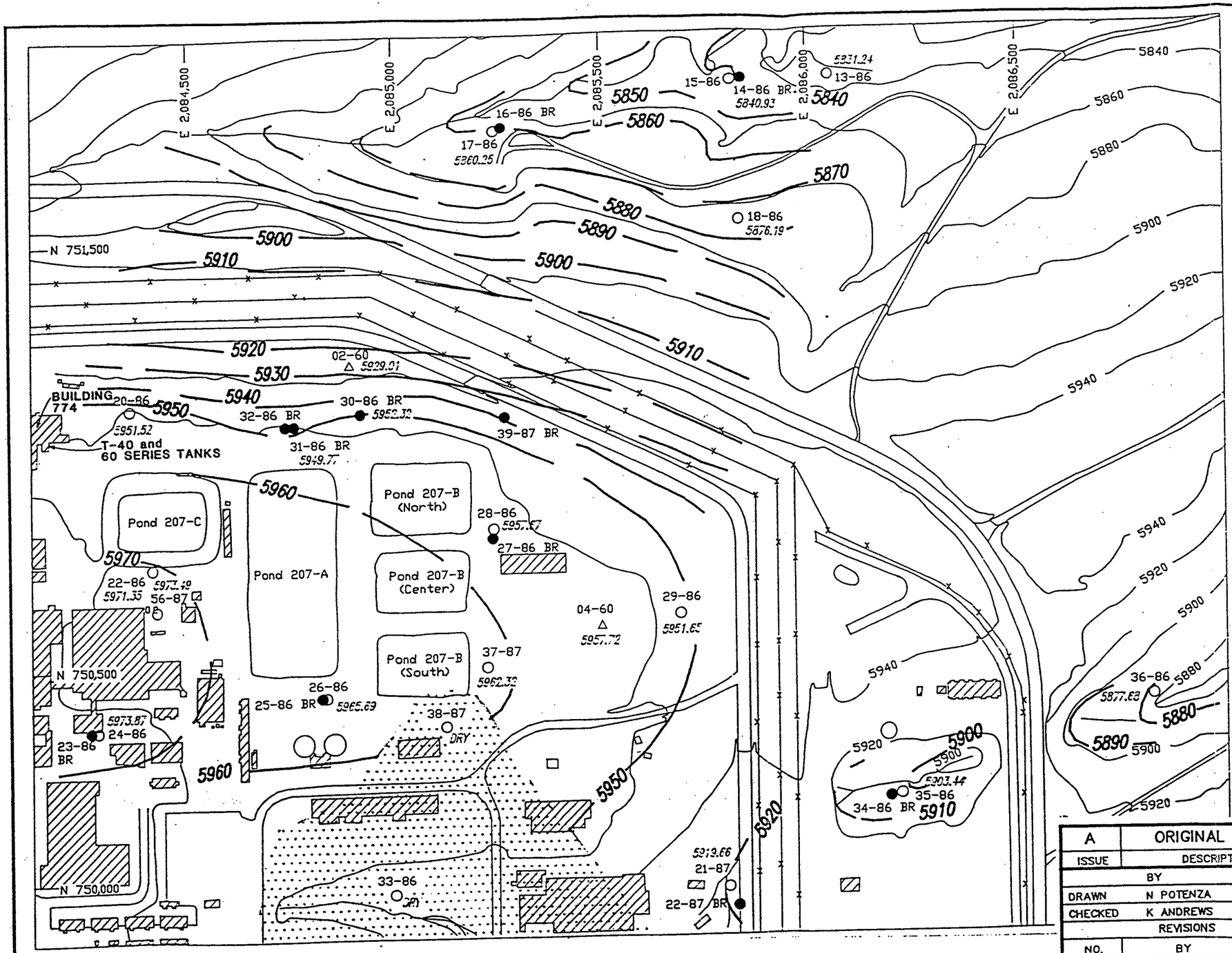
FIGURE 3.1
RCRA Closure Plan
Water Table Elevations
March 1988

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: Rockwell International, 1989b.

EXPLANATION

- ○ Alluvial Monitoring Well
- ● Bedrock Monitoring Well
- △ Pre-1986 Well
- 45-86 Well Designation
- 6028.62 Potentiometric Surface Elevation (feet above mean sea level)
- 6000 Line of Equal Potentiometric Surface Elevation (feet above mean sea level – dashed where approximately located)
- Approximate Area of Unsaturated Surficial Materials

NOTE: See Appendices E-1 and E-2 for Water Level Data

8/30/89		DE 154.01
DATE		JOB NUMBER

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ISSUE	DESCRIPTION

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SCALE: 1 INCH = 250 FEET

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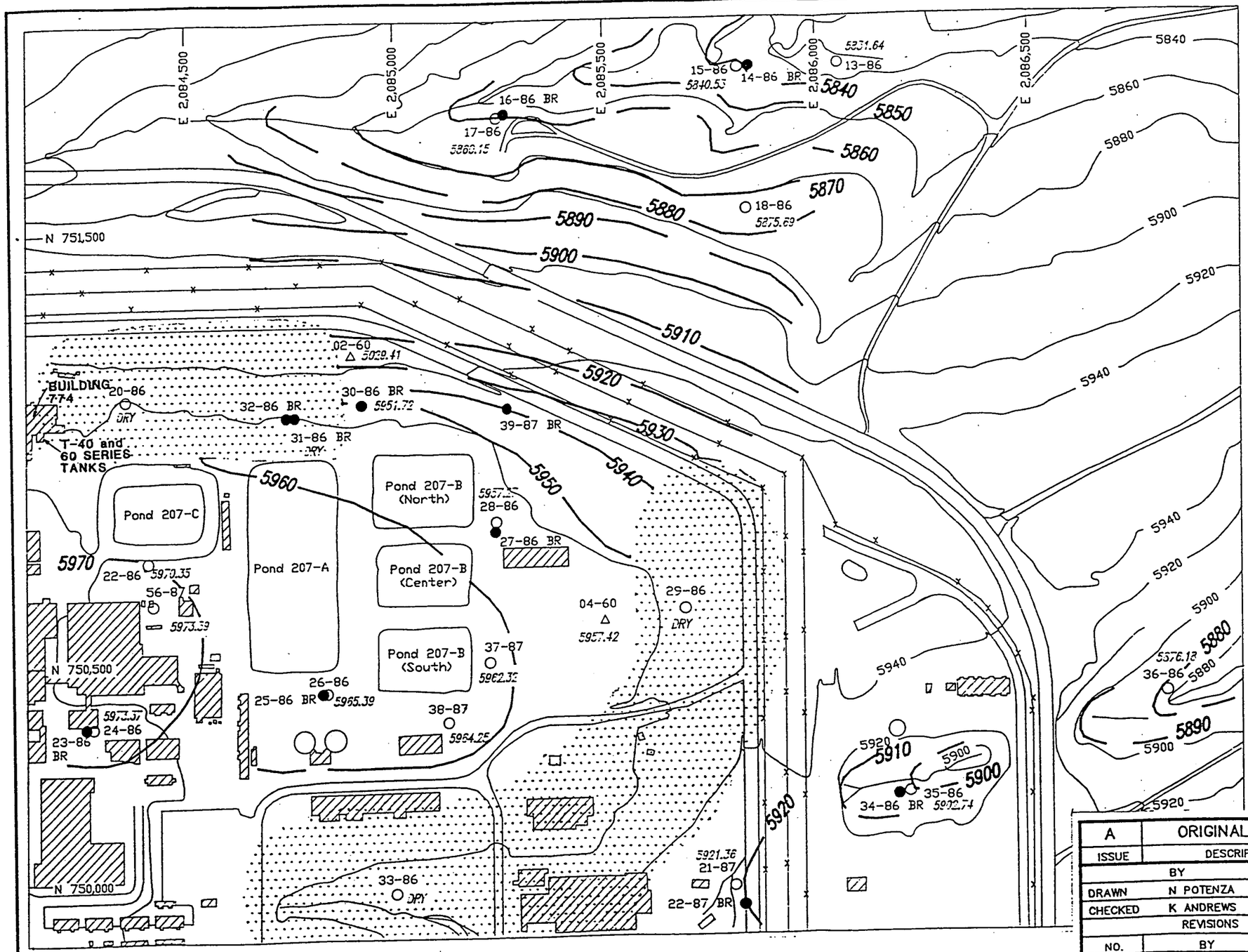
FIGURE 3.2
RCRA Closure Plan
Water Table Elevations
June 1988

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: Rockwell International, 1989b.

EXPLANATION

- ○ Alluvial Monitoring Well
- ● Bedrock Monitoring Well
- △ Pre-1986 Well
- 45-86 Well Designation
- 6028.62 Potentiometric Surface Elevation (feet above mean sea level)
- 6000 Line of Equal Potentiometric Surface Elevation (feet above mean sea level – dashed where approximately located)
- Approximate Area of Unsaturated Surficial Materials

NOTE: See Appendices E-1 and E-2 for Water Level Data

8/30/89		DE 154.01
DATE		JOB NUMBER

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	BY	DATE
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SCALE: 1 INCH = 250 FEET

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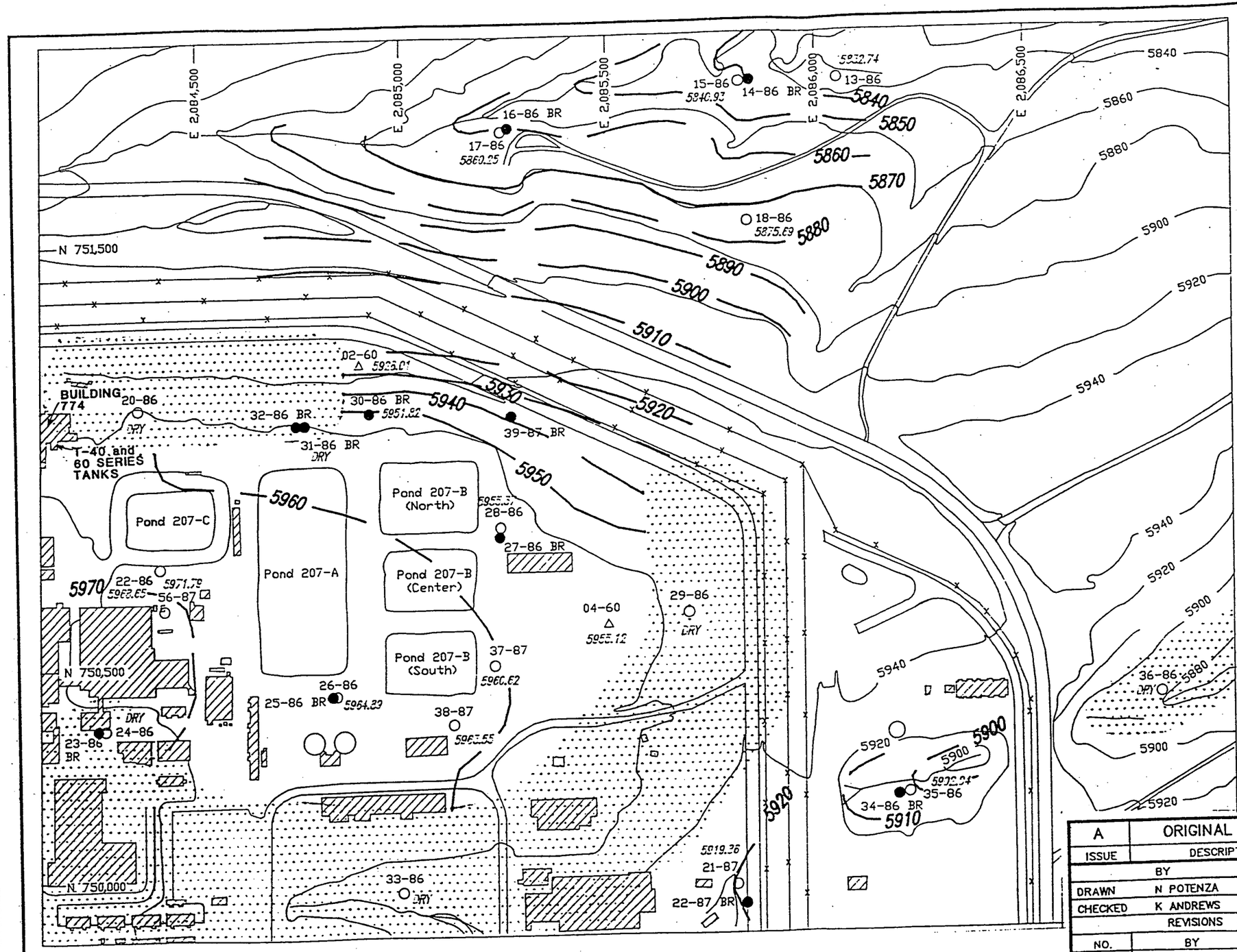
FIGURE 3.3
RCRA Closure Plan
Water Table Elevations
August 1988

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



EXPLANATION

- ○ Alluvial Monitoring Well
- ● Bedrock Monitoring Well
- △ Pre–1986 Well
- 45–86 Well Designation
- 6028.62 Potentiometric Surface Elevation (feet above mean sea level)
- 6000 Line of Equal Potentiometric Surface Elevation (feet above mean sea level – dashed where approximately located)
- Approximate Area of Unsaturated Surficial Materials

NOTE: See Appendices E-1 and E-2 for Water Level Data

N

Source: Rockwell International, 1989b.

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SCALE: 1 INCH = 250 FEET

FIGURE 3.4
RCRA Closure Plan
Water Table Elevations
November 1988

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0

LEGEND

EXISTING FRENCH DRAINS (APPROXIMATE LOCATIONS)

TRENCHES (APPROXIMATE LOCATIONS)

TRENCH NO. 5-B

TRENCH NO. 5-A

INTERCEPTOR TRENCH PUMP HOUSE

TRENCH NO. 4

TRENCH NO. 6

TRENCH NO. 3

FRENCH DRAIN SYSTEM

PUMP WELL

BLDG. 774

80 SERIES TANKS

TANK 40

TRENCH NO. 2

TRENCH NO. 1

POND 207-C

POND 207-A

POND 207-B

POND 207-B

POND 207-B

Source: Rockwell International, 1988a.

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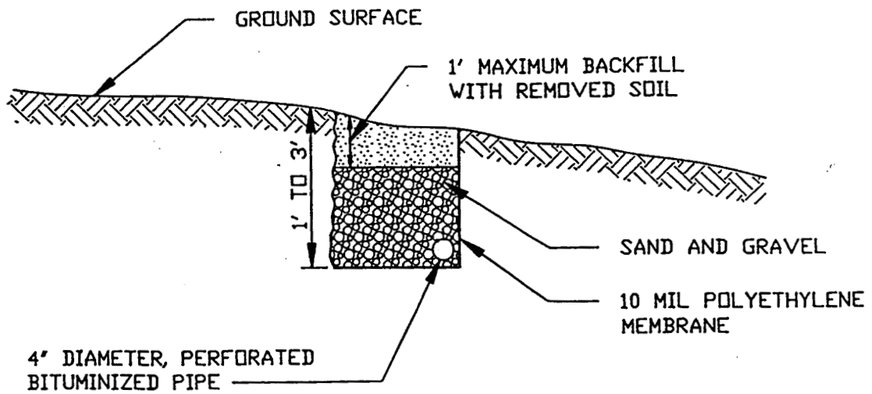
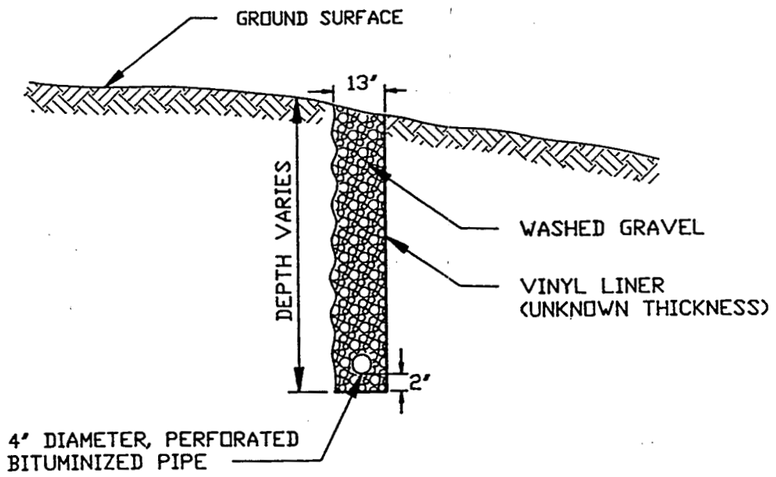
SCALE: 1 INCH = 200 FEET (APPROXIMATE)

FIGURE 3.5
RCRA Closure Plan
French Drain System

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



TYPICAL TRENCH CROSS-SECTION
(NOT TO SCALE)



TYPICAL FRENCH DRAIN CROSS-SECTION
(NOT TO SCALE)
(ROCKWELL, 1983a)

Source: Rockwell International, 1988

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15401-04

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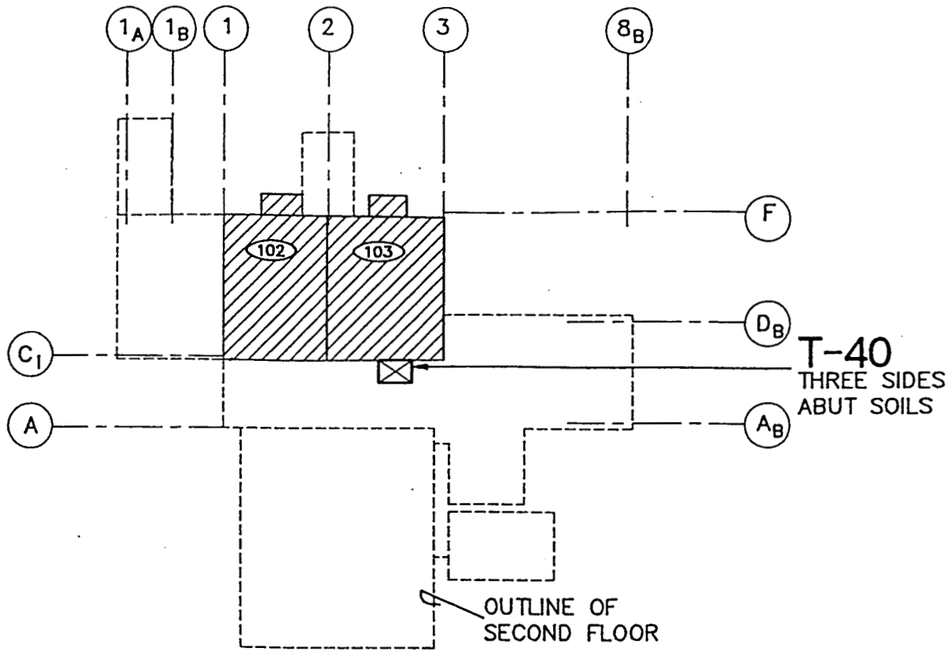
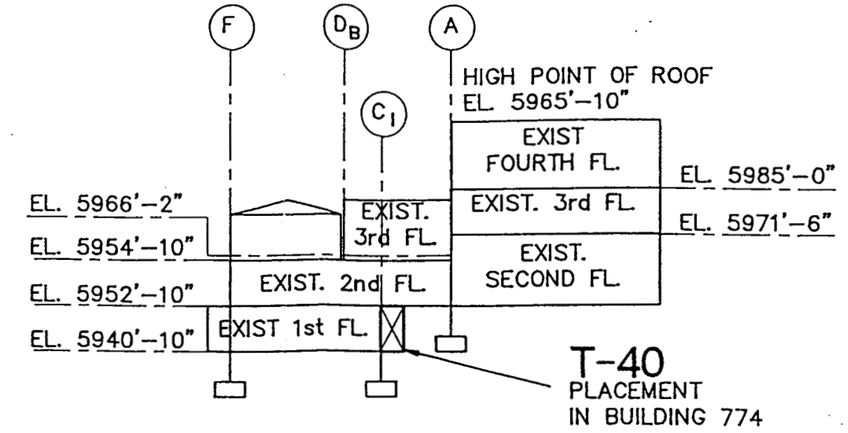
FIGURE 3.6
RCRA Closure Plan
Typical Trench and
French Drain Cross-Sections

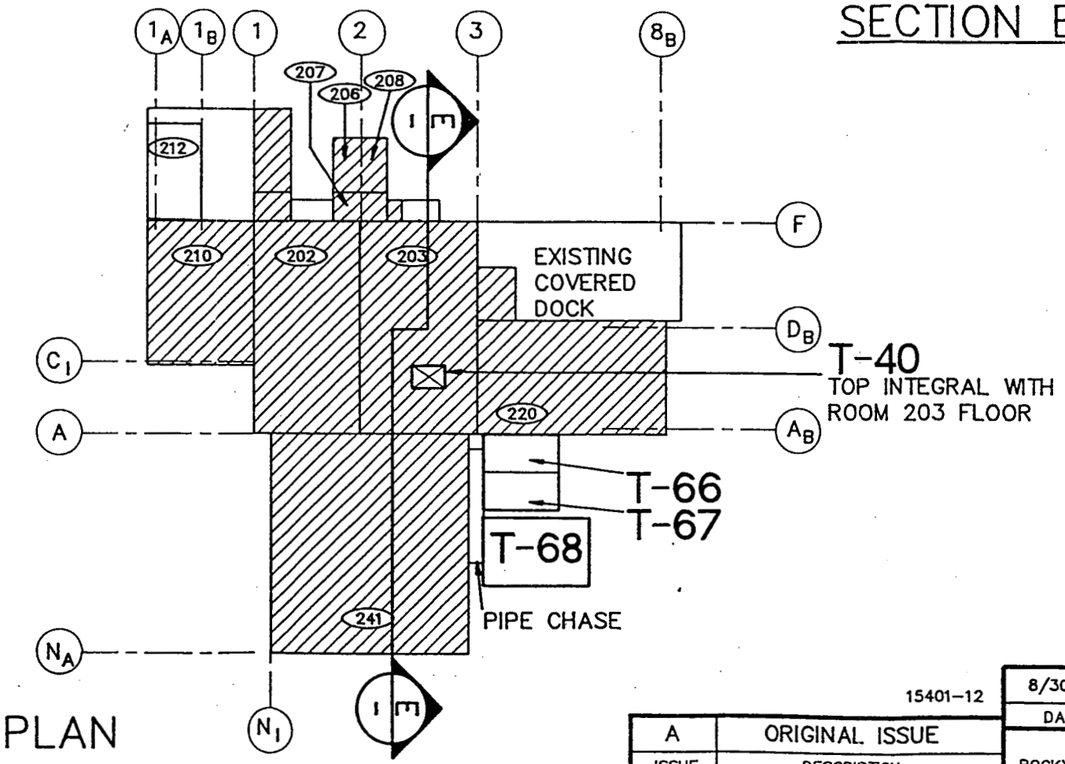
SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



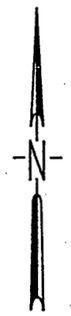
BUILDING PLAN
FIRST LEVEL



SECTION E-E



BUILDING PLAN
SECOND LEVEL



Source: Rockwell International, Drawing Number D23540-204, Issue A.

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15401-12

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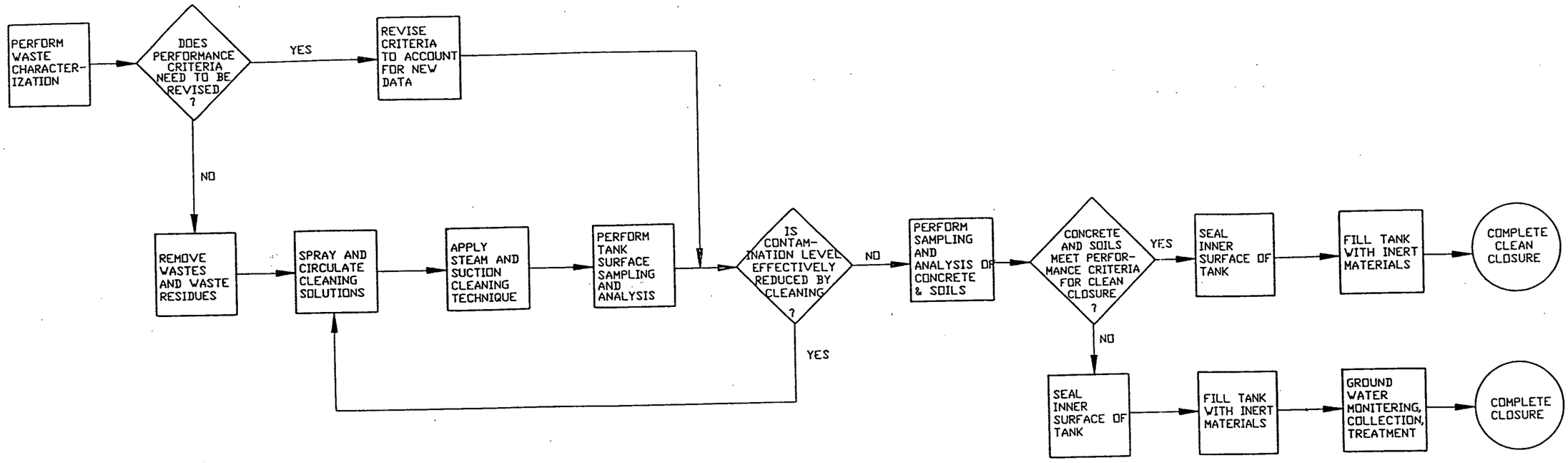
FIGURE 4.1
RCRA Closure Plan
Relationship of T-40 to
Building 774 Foundation

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



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SCALE: NOT TO SCALE

8/30/89		DE 154.01
DATE		JOB NUMBER

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FIGURE 4.2
RCRA Closure Plan
T-40 Closure Flow Chart

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0

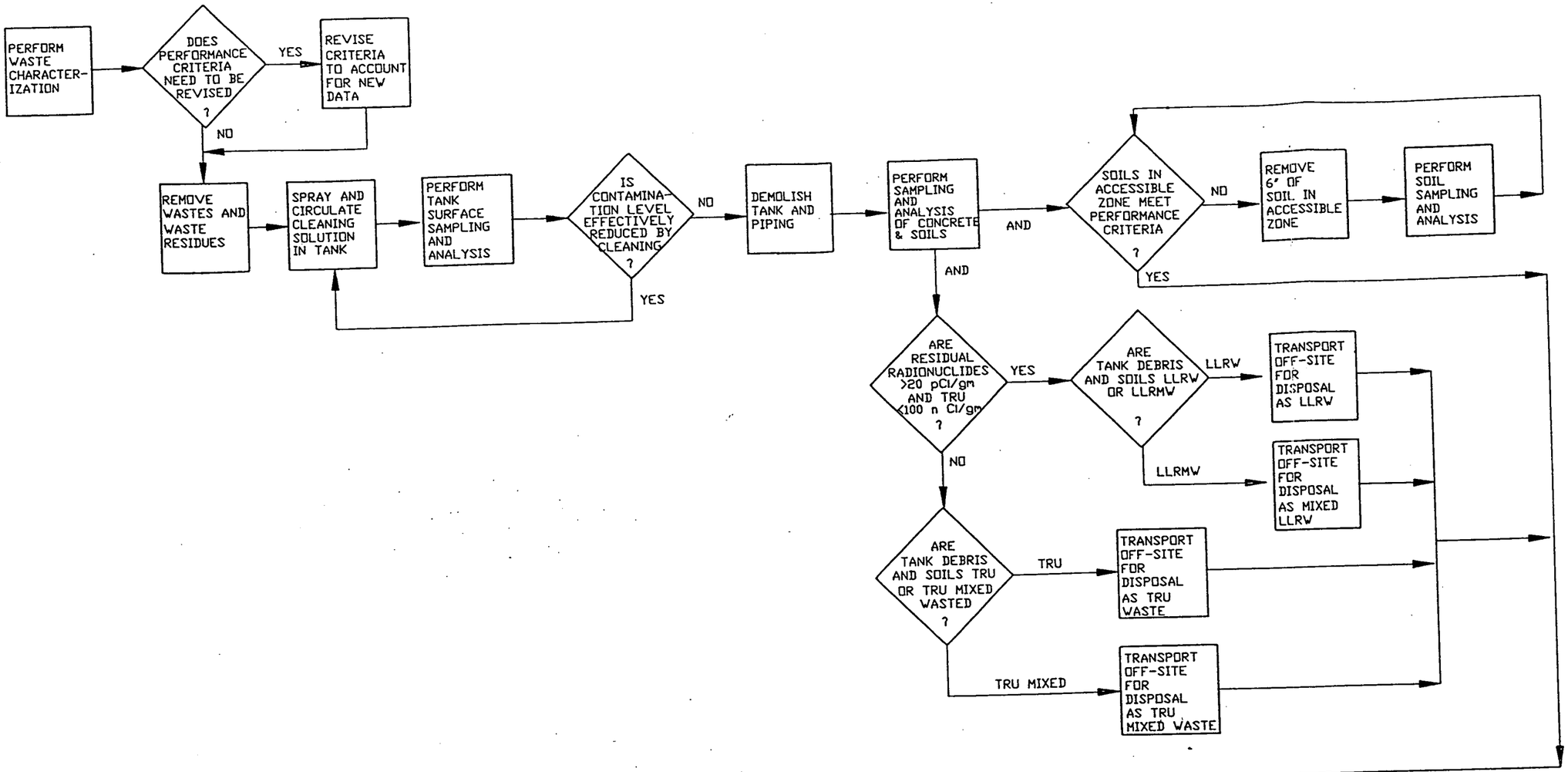

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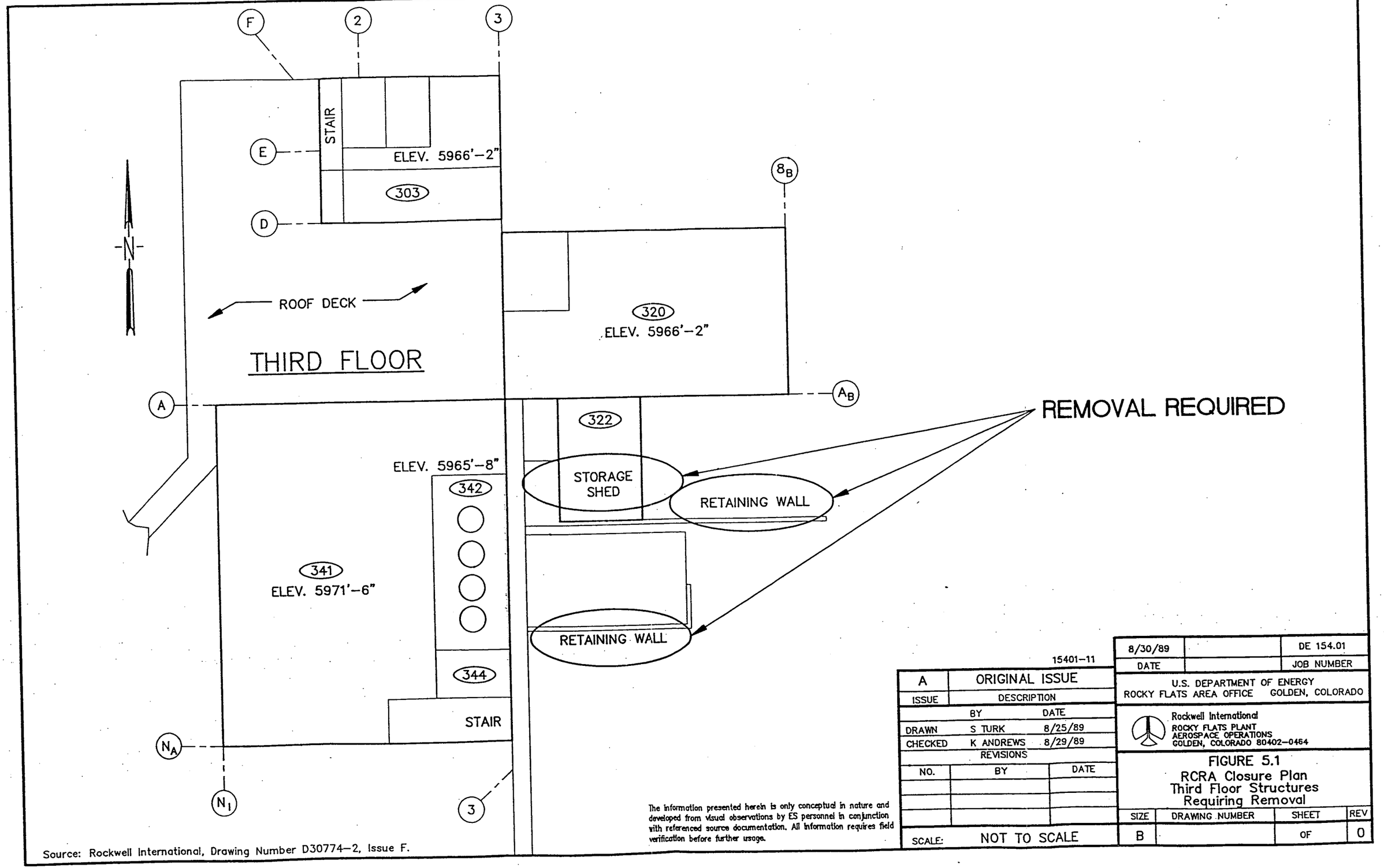
FIGURE 4.3
RCRA Closure Plan
T-66, T-67, T-68 Closure Flow Chart

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0



Source: Rockwell International, Drawing Number D30774-2, Issue F.

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FIGURE 5.1
RCRA Closure Plan Third Floor Structures Requiring Removal

SIZE	DRAWING NUMBER	SHEET	REV
B		OF	0